Specially Equipped Motor Trucks used in Central Station Service—and articles dealing with problems of public policy together with the regular departments devoted to commercial and operating practice.

Electrical World

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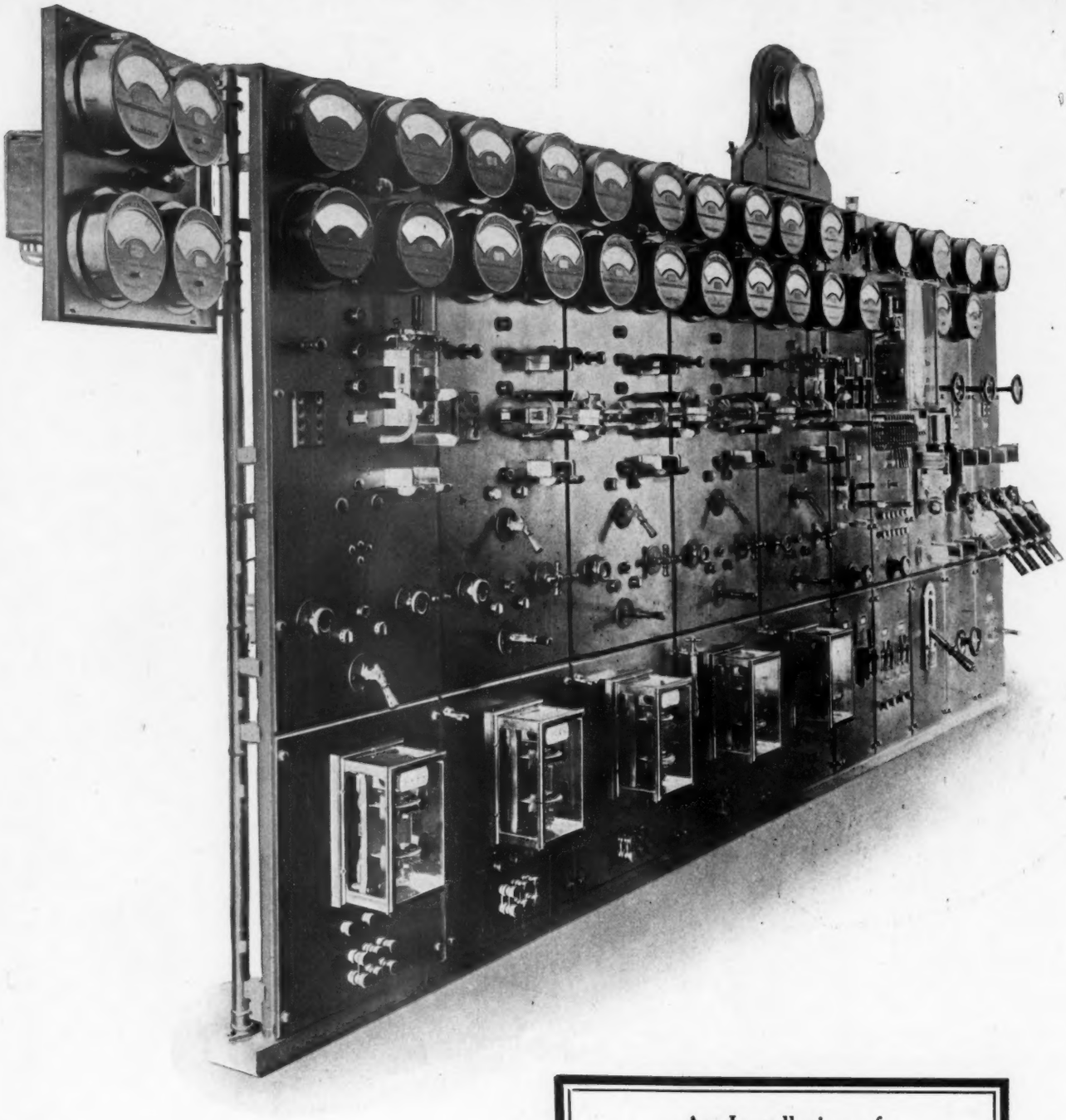

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Electrical World

The consolidation of Electrical World and Engineer and American Electrician.
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The Brooklyn Rate Case

THE complex nature of the problems involved in rate-making cases is illustrated by the length of time required by regulating commissions to reach a decision. Value of physical property, other elements of value, adjustment of rates between different classes of consumers, rate of return on capital and the legal precedents and issues demand analysis and serious consideration. In the case of the Edison Electric Illuminating Company of Brooklyn, upon which a decision has just been rendered by the New York Public Service Commission of the First District, more than four years elapsed between the first hearing and the announcement of a decision. Notwithstanding this extended deliberation the commission orders that the reduced rates are to be in effect for one year, and this is to be a test period. If the commission felt confident that its sharp reduction in the schedule was justified would it not have eliminated a test period? However, such action permits the inference that if the rates are proved to be too low they may be advanced. The commission cuts deeply into the total value claimed by the company and this is certainly discouraging to new capital investment. Whether the company accepts the decision or, as reports say it may do, contests the order, the issues which have been raised concern more than one utility—they touch the entire central station industry.

The Influence of Public Policy

PUBLIC policy can be a deep-seated influence in central station management when it inspires the rank and file as well as the responsible higher officials. Utterances by the president are not the only effective means of impressing the public with the sincere purpose of a great organization to render useful service. The daily actions of employees speak louder and much more frequently than the addresses of executives. That the sentiments of the executive shall be the public policy of the subordinate executives and employees is an axiom in a well-managed property. In a conspicuously successful public service corporation the officials are selected for advancement and for responsible positions upon their record in public policy matters; naturally such officials must meet the other requirements of their positions, but if they have merely the technical knowledge and lack the wisdom of sound public policy their equipment is held to be faulty. As the practice of the company has given it a high reputation its idea is plainly worthy of study. It gives the most painstaking attention to the training of all employees. The hit-or-miss method of selecting men without regard to their ability to get on with the public may lead to happy results or it may lead to costly disaster; but systematic, careful appraisal of men's qualifications for dealing with the public is a fundamental principle of good utility management. In correspondence and in ordinary conversation every man shows either his ability to please the public or dangerous ways of antagonizing people.

The Universities in Research

IN the great movement for national industrial organization and a new spirit in research the universities have a necessary constructive rôle. Without their sympathetic assistance in the preparation of men equipped to meet the demands of the times such a movement will fall far short of its possibilities in achievement. We learn with an interest which will be shared by the electrical industry generally of the steps taken by the Chicago Engineering Alumni of the University of Michigan, representing the technical graduate body, to enlarge the opportunities and further development of the College of Engineering and Architecture of that institution. "The administrative responsibilities of the engineer in public works, and particularly in public relations, grow year by year" is a lesson of the present era. It might have been addressed not merely to the president and board of regents of this particular institution, but to those who exert any good influence in engineering education and progress. That closer bond of co-operation which is earnestly desired between university and state, industries and nation, is of the most vital importance in the coming period of competition which will be the aftermath of the European war. To the extent that the universities appreciate and accept their responsibilities the problem will be simplified for all. Their successful development will promote achievement in the different branches of the electrical industry.

Between the Devil and the Deep Sea

THE relation between public utilities and public service commissions is a very complex one, involving law, finance, and human nature, in uncertain proportions. Some utility commissions, and some companies, work for the general improvement of the condition of electrical supply to the public, others work the thumb screw. Mr. Fleming, in a paper in the current issue, brings to the front some interesting problems in the relation between utilities management and the work of commissions. He particularly lays stress upon the obvious danger that when a company increases its dividend earning capacity by wise expenditure designed to lessen

operating expenses, there is material probability that the greater earnings will result in a call for reduced prices, so that the stockholders are in the unpleasant position of going into their pockets for a very unprofitable investment. The companies may be accused of cupidity even if they want to increase earnings by wise and skillful management, and the commissions are sometimes only too ready to take advantage of this accusation even to the extent of greatly diminishing that incentive toward improvement which ultimately of itself brings lower prices.

Now it is obviously for the advantage of the public that electrical energy should be produced in the most economical and efficient manner possible, in order that they may, as they always do sooner or later, get the benefit from such reduction. In this connection it must be remembered that electrical energy is the one necessity of human activity the price of which has been actually steadily falling through a period of unparalleled rise in the prices of everything else. If public service corporations are grasping they certainly have shown a most curious method of manifesting that disposition, in keeping down and even reducing their prices during years of swift general increase. Their stockholders certainly deserve additional income to recoup them for the increased cost of living. Mr. Fleming's remedy for the difficulties of the situation is the adoption of the sliding scale, whereby there is opportunity for a company which is enabled by wise management to decrease costs to return part of the advantage to its stockholders, while it yields the rest to the public. Under present conditions it is too often expected to give up everything and to receive nothing. The sliding scale plan as familiar in the London gas situation, and in a similar Massachusetts case, merely fixes the price for the product and a suitable dividend rate. Then for every decrease in price a small increase in the dividend rate is permitted.

By and large, this and similar plans where they have been tried have worked out fairly well. Whether they are certain to do so in every community and with every make-up of commission and supply company is not so clear, but the scheme is sound ethically, which is one point in its favor, and what is of even more importance it leads, for a term of years at least, to stable relations between the supply company and its public. It means perhaps a decade for the evolution of a reasonably sound principle, during which period prices and conditions are not turned topsy-turvy, but are worked out in an orderly manner. For this reason alone there is much to be said for the sliding scale plan. At the present time the most serious burden under which electric supply companies have to stagger is not what the commissions have done, but what they are likely to do without notice in the immediate future. Some of them have been remarkably just and reasonable, others quite the reverse; but a supply company is for this generation and the next, while the commission is for the current administration and only possibly for its successor. The most important thing for the company is a stable basis of relations with its public, and if the sliding scale can bring this about it cannot be adopted too quickly.

Incandescent Lamp Progress

THE report of the lamp committee of the Association of Edison Illuminating companies which we present this week is most important in its bearing on the future of incandescent lighting. This committee, as is well known, represents the largest users of incandescent lamps in the country united to secure the best practice obtainable in the use of lamps. Its work has been of profound importance in securing and standardizing improvements and in putting the commercial use of lamps upon a sound and logical basis. The systematic application of acceptance tests on lamps has been a very potent steadying influence in keeping manufacture upon the highest plane, and the fact that 93 per cent of the total lamps purchased by the association membership are thus tested shows how important the results have proved to be. Some valuable data on the life and performance of lamps are presented in the diagrams which accompany the report. It is satisfactory to note that the lamps hold up well to their guaranteed life.

The modification of the color tone produced by incandescent lamps has been under very serious consideration, first in the direction of the daylight lamp, with blue-tinted bulb, which gives a reasonably close approximation to white light in a very convenient and adaptable way, and at an efficiency rather better than has hitherto seemed likely. Many schemes for producing artificial daylight have been developed, the chief difficulty being, as we have more than once intimated, to decide on what we should call "daylight" for commercial purposes. These lamps seem at least to meet a considerable requirement for approximately white light and have proved their usefulness in a large number of installations. Incidentally it looks as if there were likely to be a fair demand for metallic-filament lamps giving light conspicuously less white than is their wont. There is, particularly for domestic use, a certain amount of prejudice against the color of the ordinary lamp. Without going into any fine-drawn discussion of the matter the requirement seems to have a psychological basis in the long familiarity with illuminants of generally yellowish tone. The experiments which have been tried with slightly tinted bulbs, either coated or blown from tinted glass, have been of a very hopeful character and indicate that the necessary color modification can be secured without serious loss of efficiency. Whether the call for such lamps will be sufficient to make them a recognized feature of illuminating engineering is another question, but it appears probable that for a time, and perhaps a considerable time, certain conditions can be better met by these modified metallic filament lamps than by the use of the older forms of filament.

In the standardization of lamp sizes good progress has been made. The development of metallic filament lamps has been characterized by continual experiments in sizes, resulting from a natural uncertainty as to how the increased efficiency of the new illuminant may best be put to advantageous use. Too few sizes available leads occasionally to inconvenience, too many sizes to a great deal of trouble in replacement. We have had

metallic filament lamps of all sorts of candle-powers from 10 up upon the market. The committee report before us shows a rather general preference for a moderate list of sizes, the 15, 25, 50, 75 and 100-watt ratings being the standard ones for the smaller sizes. This seems a sufficiently large choice for all practical purposes. The 15-watt lamp seems a desirable minimum, for there is little saving in energy in going to anything smaller, and a probability of rather high upkeep. The 25 and 50-watt sizes are those for general use, the latter being recognized as the standard renewal lamp. The 20-watt, 40-watt, and 60-watt lamps are likely to drop out of sight. Then for installations employing larger units the 75 and 100-watt lamps are well suited, particularly since a 75-watt gas-filled lamp is now available. It is to be hoped that uniformity in the moderate list of lamp sizes will be accompanied by a final and definite adjustment of sizes of bulbs and position of filaments, in both the vacuum and gas-filled types, so that they may be readily adapted to existing fixtures.

The changes in glassware which have been made necessary by reason of the shifting of sizes, capacities, shapes and dimensions have been a rather serious matter and have resulted in some installations truly "horrific," as our Gallic friends say. Special attention has been called to the danger of employing the gas-filled lamps with concentrated filaments in positions where there is not adequate shielding by shades. The brilliancy of such filaments is so enormous as to be extremely unpleasant, and their unwise installation in improper shades has created a very unpleasant general impression that such lamps are objectionable on account of their effects upon the eyes. The simple fact is that they need shielding even more than the vacuum lamps which themselves should never be used with filaments fairly in the field of view. The judgment of the committee that it is advisable to head off in every feasible way the use of concentrated filament lamps with filaments exposed is one which should be taken very seriously to heart. Finally, the committee comes squarely out, in favor of the flux rating for illuminants, already common in the specifications for the gas-filled lamps. The logical way to photometer such lamps is in the integrating sphere, since they are rather difficult to measure in any other way, and the obvious result would be to establish the ratings in m.s.c.p. or total lumens with the specific consumption in one or the other unit per watt. Of the two the lumen is logically preferable, although for a time at least the double rating may have to be employed as an educational measure.

Practical Factors in Electric Trucking

LOCAL transportation methods are worth more serious investigation than they receive by the average central station company. The company, in the first place, has haulage and delivery problems of its own, in which cost and service are prime elements. Money can be saved in its own business. In the second place, once a central station has worked out its own problem the answer can be passed along to other truck users in the community. In a very unusual way every central station manager has the opportunity to take from his own business proof of the value of electrical methods of one kind or another and apply them in the other man's business. The central station manufacturers' committee of the Electric Vehicle Section of the National Electric Light Association has discussed several phases of this side of promoting the electrical vehicle. Personal experience is a great educator and there are many intimate considerations in the selling of commercial electric trucks which are unseen until individual experience brings them out. Take the simple question of wages for drivers, as an example. The statement has been made generally that the electric truck could be operated by cheaper labor than the gas truck. In one city this hindered the advance of the electric truck because the drivers believed that the electric would put them out of work or result in lower wages. Simply as a matter of business judgment the co-operation of the drivers must be assured, for it is often some simple misconception of this sort that blocks a wide application of trucks. The power salesman who showed his engineer prospects a photograph of other operating engineers in isolated plants who had not lost their jobs when central station service was put in, was a practical psychologist whose theory applies also in many a truck sale. The man who operates the trucks must see the practical advantages to him. Getting the operating men in favor of electric trucks is simply one example of the value of practical study of the local transportation problem that will mean reduced operating costs for the central station and possible future sales to other local users. In working out the transportation methods other suggestive ideas will come to light. The use of old cars as trailers is referred to in an article on trucks in this week's issue. It is an illustration of the same general idea that when the central station manager begins seriously to study his transportation question he will discover the possibility of capitalizing his own experience and increasing his sales to an energy user.

The Coming Issues

NEXT week, in the station-operating number of the ELECTRICAL WORLD for November, the second issue of the month, a leading article will outline the developments in meter-testing methods and apparatus introduced by a Western operating company. Tests to determine the heating of underground high-voltage cables will be described in this number, which will also include the regular departments for the engineer and commercial man. In the engineering number, dated Nov. 18, a leading article will discuss recent progress in the construction of high-tension equipment. The fourth issue for the month will be the commercial number of the ELECTRICAL WORLD for November, featuring broad commercial and executive policies in the field. The November number of ELECTRICAL MERCHANDISING, the new monthly magazine which extends to the trade the editorial service of the ELECTRICAL WORLD, will be issued on the fifteenth of the month.

Chronicle of Events of the Industry and of Important Movements in the Field

NEWS OF THE WEEK

Reports of Conventions and Meetings of Electrical Associations and Societies

LONG SAULT WATER POWER CASE UP AGAIN

The Supreme Court of the United States to Decide the Fate of the Charter Annulled by State of New York Four Years Ago

The United States Supreme Court on Tuesday heard reargument on the fate of a water-power project at Long Sault Rapids, St. Lawrence River, said to be capable of developing 600,000 hp. and worth $180,000,000. The Long Sault Development Company's New York State charter was declared annulled in Governor Sulzer's administration, when the act under which it had been granted was repealed.

The company, which Attorney-General Carmody of New York declared was a "subsidiary of the Aluminum Trust," lost the fight to save its charter in New York Federal Courts, and appealed to the Supreme Court, which heard the first argument in April, but reached no decision.

The original charter, granted in 1907, authorized the company to generate electricity at the Long Sault Rapids, and provided for a minimum revenue to the State of $50,000. The grant was attacked under the Dix administration on the ground that the natural waters belonged to the State and should not be disposed of to private corporations. The grant was annulled on the recommendation of the attorney-general because it contravened that section of the State constitution providing that the Legislature shall pass no private privilege or franchise, and also because it violated another requirement that the forest preserve shall be forever kept as wild forest lands and never sold or taken by a private corporation. The Canadian Conservation Commission also declared against the undertaking by any corporation except the Dominion government.

NATIONAL ELECTRICAL CODE TO BE REVISED

The Electrical Committee of the National Fire Protection Association Will Meet in New York, Next March, for That Purpose

The biennial meeting of the electrical committee of the National Fire Protection Association will be held in March, 1917, in New York City, the date and place of the meeting to be announced later. As usual, the provisions of the National Electrical Code as they now exist will be considered, together with reports of all sub-committees.

Following its usual custom, the committee will issue a bulletin prior to the meeting containing the recommendations of its various sub-committees, and also the suggestions received from other sources. Suggestions for amendments to the code in order to be included in the bulletin must be specific, and where a change is desired in a rule or section of a rule definite wording for such change must be given, together with the reasons why the change is recommended. These suggestions, together with all sub-committee reports, must be in the hands of Ralph Sweetland, secretary of the committee, not later than Jan. 15, 1917.

Members of the various national societies will find a convenient means for bringing suggestions to the attention of the committee through the representatives of the societies on the committee. The following list gives the representatives of the various national associations interested in the code:

American Institute of Electrical Engineers. Farley Osgood, Public Service Electric Company, Newark, N. J.

American Electric Railway Association. Martin Schreiber, Public Service Railway Company, Newark, N. J.

Bureau of Standards, Dept. of Commerce. W. J. Canada, Washington, D. C.

Electrical Supply Jobbers Association. Franklin Overbagh, 411 South Clinton Street, Chicago, Ill.

National Association of Electrical Inspectors. J. E. Cole, City Hall Annex, Boston, Mass.

National Electrical Contractors' Association. William C. Peet, 70 East Forty-fifth Street, New York City.

National Electric Light Association. W. H. Blood, Jr., Stone & Webster, Boston, Mass.

As heretofore, the meeting will be open to all interested, and such persons will not only be welcome, but are urged to be present and give the committee the advantage of their experience and advice. The secretary's address is 141 Milk Street, Boston.

DEVELOPMENT IN RESEARCH WORK

Recommendations for Growth of Engineering College of University of Michigan Presented by Chicago Alumni

A memorandum giving concrete recommendations on the opportunities and development of the College of Engineering and Architecture had been presented by the Chicago Engineering Alumni to the president and the board of regents of the University of Michigan. It represents the composite opinion of nearly 500 engineers in active life, apportioned through the classes from 1860 to 1914.

All engineering graduates were invited to express themselves upon: 1. The desirability of a close inquiry by the board into the present status of the Engineering College, its work, facilities and opportunities. 2. Whether the prevailing movement toward industrial research should find expression in the immediate establishment of adequate facilities therefor at the university supported as far as possible by private endowment. 3. The disposition of the results of such research work when conducted with the assistance of outside parties commercially interested in the results.

A general appreciation of the need of progress was expressed. Upon the last-named question 12 per cent favored exclusive use of the results of research work by the donor, 40 per cent favored limited use by the donor, 19 per cent favored full publicity, and 29 per cent were non-committal or uncertain.

Among the additions to work in the electrical laboratories which it is desired to undertake are studies in telephonic and radio-transmission, methods of minimizing the cost of copper in transmission and distribution systems, etc. To study transmission problems adequately the laboratory should have an artificial transmission line equipment and an adequate high-voltage testing transformer set.

An adequate hydraulic laboratory is at present the

most important necessity. The university is fortunate in securing from the Detroit Edison Company a site and water rights at Barton Dam. Out of fourteen college laboratories, only one, at Cornell University, has such a large gravity supply of water available. With proper facilities invaluable work could be done in turbine testing, water measurements, stream flow, etc.

Among the broader services rendered to the state and industries is the valuation of public utility properties totaling approximately $1,300,000,000, about 90 per cent of which was done under commission of cities or the state. A research bureau could become a state bureau of standards, and could co-operate with a central research organization. Among its logical activities such an organization would be invaluable in formulating the conditions and making possible the establishment of more intimate trade relations with Pan-American countries.

JOVIAN FEDERALIZATION POLICY

Present Administration Will Avoid Arbitrary Application of Constitutional Changes Involving Chartering of Local Organizations

In some thirty cities throughout the country there is evident the desire for an expression of the policy of the present Jovian administration relative to application of recent changes in the Jovian constitution. This particularly applies to those clauses regulating and restricting the use of the Jovian name and perquisites without the possession of an official Jovian charter.

In defining his idea of what policy this administration will pursue, mercury Ell C. Bennett, of St. Louis, in an interview with a representative of the ELECTRICAL WORLD, stated that he felt he could assure the local organizations that no arbitrary or destructive policy would be adopted.

On the contrary, he believes that while those at the head of the order see that the maximum effectiveness of local leagues will be largely dependent upon federalization. Still if this cannot be accomplished immediately, ample time will be given to work out the problem on a satisfactory and practical basis. He further stated that in no event will any action be taken toward any local organization without first securing the counsel of the local men in charge. Technically the new constitution went into effect on Oct. 16 but the interpretation will be sufficiently liberal to conform to the exigencies of local situations.

Mr. Bennett anticipates that many leagues will follow the examples of the Cincinnati and Kansas City organizations and apply for a charter when they understand what the relation will be between the leagues and the national order.

BUFFALO LAWS INVALID

New York Court of Appeals Decides Against Vote on Municipal Lighting Plant

Residents of Buffalo will not be permitted to decide by referendum next Tuesday whether a municipal electric light and power plant shall be provided there and whether a proposed telephone merger shall be approved, the Court of Appeals of New York ruled on Tuesday.

The decision was reached in a taxpayer's action which questioned the legality of a Common Council ordinance intended to authorize the submission of the two questions to the voters. Chief Judge Bartlett wrote the prevailing opinion, which held the ordinance invalid. Judge Pound, although sustaining the ordinance, held that the questions were prepared for submission in improper form.

ORDERS BROOKLYN EDISON ELECTRIC RATES REDUCED

Public Service Commission Lowers Maximum and Other Rates After Valuation—Test Period of One Year

A decision reducing rates of the Edison Electric Illuminating Company of Brooklyn from a maximum of 11 cents per kilowatt-hour to a maximum of 8 cents per kilowatt-hour, with corresponding reductions in other rates, has been issued by the New York Public Service Commission of the First District. The company has not yet announced whether it will accept the decision, although reports have been circulated and published that it will make a contest in the courts.

The commission directs the company to reduce its present retail lighting rate of 11 cents to 8 cents for the first 2 kw.-hr. average daily use per month, from 8 cents to 6 cents for the second 2 kw.-hr. average daily use per month, and retains the present rate of 4 cents for the excess use over 4 kw.-hr. average daily use per month. The company is also directed to reduce its retail power rates from a maximum of 10 cents per kilowatt-hour to 8 cents per kilowatt-hour. Lamp renewals and installations are to be charged at 0.5 cent per kilowatt-hour, but the company must furnish instead of Gem or carbon lamps, which it now furnishes free, tungsten lamps or lamps of equal efficiency. The minimum of $1 per month for service charged against consumers is left undisturbed, but the charge must be credited against consumption of energy where such consumption exceeds $12 per year.

Discriminatory features in the rate schedule applicable to wholesale consumers, especially one relating to discounts given according to increasing consumption, are condemned by the commission, and the company is required to eliminate such discrimination.

Commissioner Hayward, who prepared the opinion, describes the present rate system of the company as elaborate and complex. Although the maximum price is 11 cents per kilowatt-hour, certain consumers were furnished at less than 2 cents per kilowatt-hour for low-tension energy and about 1 cent for high-tension energy. Retail consumers paid on an average 9 cents per kilowatt-hour for lighting, but less than 5 cents for energy used for power purposes. Large consumers obtained low-tension energy for lighting and power at an average of less than 3 cents per kilowatt-hour, and a very important group paid less than 2 cents.

The Edison system had outstanding on Jan. 1, 1916, total capitalization of $27,709,000, exclusive of $800,000 interest-bearing floating indebtedness. Commissioner Hayward holds that the securities representing this capitalization stand for more than the property of the system now used for supplying energy, and for much more than the money and property or services at their cash value originally received by the companies forming the system in exchange for their securities. This excess, Commissioner Hayward states in his opinion, was about $6,640,000, and represented securities issued for which no tangible property exists. On the actual amount of capital contributed, he finds, the total dividends and interest averaged approximately 9 per cent per annum.

The commission, while considering capitalization as one of the elements to determine a fair rate, was governed largely by its appraisal of the physical property. The company claimed a valuation of more than $38,800,000, exclusive of franchises and going value. The commission rejected a number of the items and allowed approximately $22,000,000. The principal items of difference were depreciation, which the commission deducted from the cost new, amounting to $7,140,000;

overhead, $1,096,000; claims for items which the company had charged to operating expenses, $4,033,000; stock issued for license to use Edison's patents $945,000, and cost of unifying the system, $3,587,000. The company contended also for an additional allowance for "going value," and furthermore for the value of its franchises, citing the Consolidated Gas case as a precedent.

The company contended that, so long as its plant was rendering the same service that a new plant would render, the plant should be valued at its original cost or "service value," irrespective of wear and tear upon the system. The company maintained, however, the right to set aside annually out of its revenues large sums for depreciation and renewal. The commission holds that it is bound by the authority of decision of the Appellate Division in the Kings County Lighting case, where a deduction for depreciation, complete and incomplete, physical and functional, from the reproduction cost new in valuations for rate-making purposes, was approved.

Commissioner Hayward reduces the amount claimed by the company as an allowance for "overhead expenses," saying that "allowances for overheads must not be imaginary or without proof by the utility that it is clearly entitled to them."

The commission rejects over $4,000,000 for expenditures on account of property, overhead construction and development expenses paid out of revenues earned by the company. It points out that if this amount were included in the valuation, a corresponding deduction would have to be made from the operating expenses, so that the result would be about the same.

On the claim for stock issued by the original companies for licenses granted to them to use Edison's patents the commission allows nothing, holding that the Hughes Investigating Committee had rejected an allowance for this purpose, and that no value remained after the expiration of the patent license to represent existing capital. Likewise, the commission refuses to permit the capitalization of franchises. Capitalization amounting to over $3,500,000 in connection with various intercorporate mergers and changes, resulting in the unification of the system, is also disallowed.

For "going value" the company claimed more than $3,600,000, contending that upon a valuation claimed by it the company had sustained a deficiency in a fair return. Commissioner Hayward in his opinion points out that, upon a 7 per cent return upon the company's property throughout its history, there was no deficiency in a fair return, but that, on the contrary, the public had paid in excess of a fair return approximately $5,500,000.

As to the rate of return, the company claimed an allowance of 8 per cent on its valuation. The commission, however, allowed but 7 per cent on a capitalization of $22,000,000. The commission finds that during the year 1915 operating revenues were $6,923,552, and the operating expenses $4,259,471, leaving a net income of $2,664,081. This resulted in a return of 12.4 per cent upon the valuation fixed by the commission.

As no complaint had been made with regard to the wholesale rates, but, on the contrary, as defendants contended that the wholesale rates were too low, the commission, assuming that the wholesale rates were fair and that wholesale consumers bore their fair proportion of expenses, holds that the excess revenue over the requirements for a fair return should be applied to the reduction of the retail rates. This excess amounted to about $1,167,000, and the commission, therefore, holds that the retail rates are excessive by about $1,150,000.

The commission criticises the manner in which the company applied the theory of maximum demand in determining the rates to be charged consumers. The company fixed the maximum demand at not less than 1.5 kw.-hr., whereas more than a majority of customers had installations of less than 1.5-kw. capacity. The commission, therefore, fixes the maximum demand basis at 25 per cent of the rated installations for residences, and 50 per cent for other premises, with a minimum rating of 250 watts.

The commission finds a flat-rate system to be objectionable, as not taking into account fully the constant consumer costs, incurred for small and large customers, and the decrease in service cost for consumers using current for increasing number of hours. The commission, therefore, approves the general system of differentiating rates in accordance with hours' use, as tending to stimulate the application of electricity to new uses during the day, particularly in the home.

The present retail rates for power are as follows: 10 cents for first 25 kw.-hr. monthly use of maximum demand; 5 cents for second 25 kw.-hr. monthly use of maximum demand; 3 cents for excess over 50 kw.-hr. monthly use of maximum demand; subject to schedule of discounts upon quantity. The commission finds these discounts to be in effect rebates, and orders them to be abolished. This should result in a saving to the company of about $40,000.

The new rates are to go into effect on Dec. 1, 1916, and to continue in effect for twelve months thereafter The commission fixes a period of one year for a test of the new rates.

INTERCONNECTION OF BRITISH GENERATING SYSTEMS

Nation Divided Into Areas and Local Committees to Be Appointed to Consider Problems in Their Respective Areas

Definite action has been taken toward the nationalization of energy supply for England. The national electric power supply joint committee, which has been formed jointly by the Incorporated Municipal Electrical Association and by the Incorporated Association of Electric Power Committees, has sent out to the various town clerks and engineers of municipal supply undertakings and to the secretaries and engineers of company supply undertakings a memorandum with a covering letter stating that the engineer of one of the undertakings in each of the areas into which the country has been divided has been asked to act as convener for the area, and that he will invite the engineers to attend a general meeting to appoint a local committee.

These local committees, it is proposed, will be formed to consider problems presented in their respective areas and to report to the national committee.

The problems to be considered by the local committees include:

1. The consideration of the areas shown on the accompanying map with a view to their better division if considered desirable.

2. The best methods of interlinking the existing generating stations with a view to their more economical operation, and to the better security of the supply.

3. The best means of providing the capital required for the plant and mains that are necessary, and for the equitable allocation of the same.

4. The best methods of payment between undertakings for any current supplied or interchanged.

5. Any special local arrangements that are considered desirable.

The memorandum, after referring to the importance to the electric supply industry of the Board of Trade cir-

cular letter of May 25, 1916, and to the forming of the joint committee to consider the question of linking up in all its aspects, states that the importance of linking up large stations with small ones, where such linking up can be carried out with undue capital expenditure, is now becoming more generally realized.

The joint committee has arrived at the following conclusions with regard to the suggestion contained in the Board of Trade letter:

1. That linking up is important for the purpose of saving fuel, saving labor and increasing the security of supply, and, in the future, making for economy of capital.

SUGGESTED ELECTRIC SUPPLY DIVISIONS OF GREAT BRITAIN

2. That the question of linking up should be considered broadly from the national point of view, and having in mind not only the saving of fuel, but the interests of consumers in obtaining a cheap supply of electricity for all purposes.

3. That while the generation of electricity as distinct from its distribution must be considered broadly and irrespective of the present areas of electricity supply undertakings, clearly all existing rights must be respected and existing areas must not be interfered with as regards distribution.

4. That the linking up of many existing stations could be carried out immediately without further legislation.

5. That in order to arrive at a better understanding of the problem, committees of engineers representative of local electricity supply interests should be appointed in various parts of the country.

The memorandum further states that to facilitate the formation and work of the local committees the map has been prepared, showing a provisional subdivision of the country into areas; but if local circumstances in any area make it desirable to alter the definition of these areas, it is, of course, open to them to suggest any such alteration. A local committee has already commenced work in the Lancashire area.

BOSTON EDISON MAY INCREASE CAPITAL STOCK

President Edgar in His Annual Report States That in View of the Additions to Property This Action Seems to Be Desirable

The annual report of the Edison Electric Illuminating Company of Boston for the year ended June 30, 1916, has recently been issued. The report shows gross earnings of $8,302,814.55, which is almost $1,000,000 more than in the previous year. A considerable program of new construction which was made necessary to carry out during the year is commented on. President Charles L. Edgar was of the opinion that as a result an increase in capital stock seems desirable.

A comparative statement of operations follows:

Year ended June 30:	1916		1915
Gross earnings	$8,302,814.55		$7,429,124.50
Expenses	3,625,417.23		3,426,832.21
Net income from operations.	4,677,397.32		4,002,292.29
Miscellaneous profits	124,050.91		118,909.65
	4,801,448.23		4,121,201.94
Taxes	954,760.24		843,450.00
Net earnings	3,846,687.99		3,277,751.94
Interest $276,234.90		$371,474.95	
Dividends 2,702,184.00	2,978,418.90	2,457,174.00	2,828,648.95
Undivided profits	$868,269.09		$449,102.99

It will be seen that the undivided profits this year are very much larger than for the years 1914 and 1915 and somewhat larger proportionately than for the year 1913, which was the last year in which the general financial conditions of the country were normal.

"The policy of postponing expenditures for new construction, owing to the state of war in Europe, referred to in last year's report," President Edgar said, "was continued during the earlier part of the current year, but the very large increase of prospective new business and the insistent demand for extensions have made it seem desirable to revert to the old policy of making extensions wherever the income warranted it. The new construction work undertaken during the year has, for these reasons, been much larger than for the year 1915.

"In view of these additions to your property an increase in the capital stock of your company seems desirable, and you will probably be called together at an early date to take action upon this matter.

"In common with all other employers of labor your company has had to make material increases in its payroll during the year. It is estimated that for the coming year the total payroll will increase about 12 per cent, somewhat over $250,000. One-quarter of this is due to the natural increase in the business; the other three-quarters is due entirely to increases in pay or decreases in the working hours. It has always been the policy of the management to treat its employees at least as well as those employed by other corporations in the same line of business, and the increases referred to have been made for the purpose of continuing that policy."

November N.E.L.A. Committee Meetings

Four meetings of National Electric Light Association committees are scheduled for November. On Nov. 8 the committee on commercial service and relation with customers, R. F. Bonsall, Consolidated Gas, Electric Light & Power Company of Baltimore, chairman, will meet at the association's headquarters in New York City. The electric range committee, C. E. Michel, Union Electric Light & Power Company of St. Louis, chairman, will meet at the Jefferson Hotel, St. Louis, on Nov. 13. The following day the committee on salesman's handbook, R. H. Tillman, Consolidated Gas, Electric Light &

Power Company of Baltimore, chairman, will meet at association headquarters. The fourth meeting, that of the lighting sales bureau, Thomas F. Kelly, Dayton Power & Light Company, chairman, will be held on Nov. 24 at headquarters.

BOILER CODE LEGISLATION UNDER DISCUSSION

Meetings to Be Held in Buffalo and Washington to Consider Uniformity of Boiler Standards Throughout the Country

The second meeting of the boiler code committee of the Industrial Commission of New York State since its organization Oct. 5, 1916, is scheduled for Nov. 27, 1916, at Buffalo, N. Y. Thomas E. Durban, chairman administrative council of the American Uniform Boiler-Law Society, who is acting in an advisory capacity with the industrial commission, expresses the opinion that after the matter has been thoroughly canvassed the state of New York will adopt the A. S. M. E. boiler code for new work. The part dealing with present installations may require changes to meet conditions as they exist in this state.

The industrial commission of Ohio has announced a meeting to discuss boiler legislation which will be held at the Willard Hotel, Washington, D. C., Dec. 4, 1916. Representatives to be appointed by governors of the following states are expected to be present at this meeting: Louisiana, Texas, Arkansas, Pennsylvania and Illinois. Representatives from the cities of Little Rock, Ark., St. Louis, Mo., Chicago, Ill., and Detroit, Mich., will also be present.

Speakers of national reputation have accepted invitations to take part in this meeting and urge the advisability of all states adopting the same standard in the interest of uniformity together with the necessity for legislation as a safety measure and as promoting efficiency and the best possible service. This discussion will be in line with the aim of the Uniform Boiler-Law Society which is supporting the code as the best possible measure to protect human life in accordance with the predominant "safety first" thought of the American Institute of Mechanical Engineers when the boiler code was formulated.

CONVENTION OF RAILWAY ELECTRICAL ENGINEERS

Various Committees Report on the Electric Lighting and Power Problems of Train Equipment, Yards and Shops

The ninth annual convention of the Association of Railway Electrical Engineers was held at the Hotel LaSalle, Chicago, Oct. 31 to Nov. 3. At the first session President E. W. Jansen, electrical engineer for the Illinois Central Railroad, called attention to the fact that the committee reports of the association have considerable weight with other associations. He also pointed out that the work of the car-lighting committee and the committee on standard car wiring have produced especially acceptable results. The remainder of the morning session was given over to association business.

It was the plan of the convention to make the sessions as short as practicable without curtailing discussion, so that delegates could spend much of their time in studying the manufacturers' exhibits, which occupied practically the entire space of the nineteenth floor of the hotel.

The technical program which followed the general business session contained committee reports on industrial trucks, head lamps, a car-lighting handbook, lighting of railway yards, rating of train-lighting lamps, standardization of sizes of ball and roller bearings for motor equipment, wireless telephone and telegraph, crane, turntable and transfer-table motors, shop practice, electric welding, train-lighting equipment and practice, standardization of axle generators, and metal conduit.

The entertainment program included an informal reception, theater party, informal dance and banquet dance. The total registration at the Chicago meeting was about 150.

STATUS OF LOS ANGELES POWER NEGOTIATIONS

Power Companies Make Offer to Sell Systems for $12,561,500 on Partial Payment Plan—City's Offer Is $10,000,000

Negotiations between representatives of the city of Los Angeles and the three electric companies for the possible sale of the companies' distributing systems to the city and purchase of surplus power by the city from the companies have reached a stage where both parties have settled on definite offers. While the propositions advanced respectively by the city and the companies are rather wide apart now, neither party to the negotiations is presenting its position as an ultimatum, and Mayor Woodman of Los Angeles and President Miller of the Southern California Edison Company, who are leading the negotiations, have expressed the hope that further negotiations may develop a common basis of advantage by which the situation may be cleared up without resorting to the unsatisfactory methods of destructive competition.

The power companies make a unified offer to sell to the city the local distributing systems, excluding Los Angeles Gas & Electric Company's steam plant, for $12,561,500, on a partial payment plan. The initial payment would be $3,561,500, the balance in installments on a sliding scale through a ten-year period, with 6 per cent interest on deferred payments. The distribution of the proceeds among the three companies is not involved in the negotiations with the city. The basis for this figure is the valuation placed on the Edison system in the majority decision of the California Railroad Commission, $4,750,000, with addition of extensions to date, $232,400, making a total of $4,982,104. This amount is figured to represent 40.574 per cent of the total property involved, and in this ratio the amount representing the total valuation is $12,561,500. The city claims that the Edison property is 46 per cent of the total, and the adoption of this ratio would make a corresponding reduction in the total figure.

In case the city should pay cash the companies set a price on the distributing systems of $12,279,000 plus $1,412,000 as bond retirement expense; total, $13,691,000. The companies figure that they would be put to an expense of 11.5 per cent in retiring bonds now and issuing new bonds later. The city claims that the Railroad Commission valuation was based on a cash transaction, so there is about $1,000,000 divergence between the positions of the respective parties on this feature. These proposals of the companies are based on their retaining the electric railway supply business, and on the city entering into a contract with the companies to purchase for a ten-year period 50 per cent of its power used at 1.41 cents, delivered at the city receiving substation at 30,000 volts. It is also pro-

posed that the city shall bind itself for an additional period of twenty years to buy of the companies any power it may need in excess of that developed by its hydroelectric plants. Under the companies' estimates of probable future demand, based on 10 per cent compounded annual increase in gross business, the companies would receive for power during the ten-year period $17,711,000. The city concurs in the estimate of annual future power consumption, and claims that this amount would give the companies about $10,000,000 above Mr. Scattergood's estimate of the cost to the city of generating its own power. Under the proposed contract the city would not require any power from the Owens River project, development of which it has started, for ten years, and it is a question if it would not lose its rights to the water power by so delaying completion of development.

The city offer for the distributing systems, including the Los Angeles Gas & Electric steam plant, now stands at $10,000,000. It offers to buy power from the companies for a period of five and a half years, on a sliding scale, 25,000 kw. for one and a half years, 15,000 kw. for the next two years, and 10,000 kw. for the next two years, at 0.085 cent per kilowatt-hour, which would give the companies $2,345,490 for power in the whole period, with no proviso for purchase of power beyond this date. This offer is based on the idea that by the end of five and a half years the city's hydroelectric power would be developed to equal its needs, and the Edison company would be able to develop outside business to replace the load thrown off by the city. The companies are obtaining for power supplied the electric railways 0.65 cent, and the city bases its offer of 0.85 cent partly on this figure, with allowance for difference in load factor, and the assumption that the city can generate its own power for about 0.6 cent.

The city's proposition submitted to the Southern California Edison Company, the Pacific Light & Power Corporation and the Los Angeles Gas & Electric Corporation is as follows:

"The city will purchase all your properties, real and personal, used, necessary or convenient for the purpose of distributing and supplying electric energy in the territory embraced within the city of Los Angeles, and unincorporated territory outside of and immediately contiguous to said city, the total property of the Pacific Light & Power Corporation facing on Los Angeles, Third and San Pedro Streets, and the total steam plant and other property of the Los Angeles Gas & Electric Corporation located at Alameda and Palmetto Streets, excluding the general warehouse on Railroad Street and the generating plant known as L. A. No. 3 of the Southern California Edison Company, and the general warehouse on Seventh Street and the office property at 645 South Hill Street of the Los Angeles Gas & Electric Corporation, but including substation equipment in use, located on properties so excluded, at and for the lump sum of $10,000,000.

"The city will purchase from you electric power for a period of five and a half years in the amount of a yearly peak of 25,000 kw. for the first one and a half years, 15,000 kw. for the succeeding two years, and 10,000 kw. for the remaining two years, at a yearly load factor of 35 per cent, and in amounts from hour to hour, from day to day and from month to month throughout each year of such five and one-half year period, in conformity with and proportional to the demands for electric power within the city of Los Angeles, exclusive of railway power, as indicated by your records for the fiscal year from July 1, 1915, to June 30, 1916, inclusive, together with such additional amounts of power as the city may need to purchase from time to time during such period, within the limits of your surplus supply, and pay for the same at the rate of 0.85 cent per kilowatt-hour, meter measurement, at 33,000 volts.

"The city will pay such purchase price out of moneys on hand and such additional funds as may be derived from the sale of electric plant bonds to be authorized by voters of the city at an election to be called as soon as practicable after you shall indicate in writing your acceptance of the foregoing proposition, such proposition, however, being subject to the contingency that bonds for such purpose shall be authorized by the voters at such election.

"Within ten days after such bonds shall have been authorized by the voters, but not earlier than Jan. 1, 1917, possession of said properties shall be delivered to the city and the foregoing provision for the purchase of power from your companies shall become operative. The city will pay to the companies at the time of such delivery a substantial sum on account of the purchase price of said properties and under such contract of sale thereof as the parties shall agree upon, and the balance of such purchase price at such date or dates thereafter as may be prescribed in such contract, together with interest on such deferred payments at the rate of 5 per cent per annum.

"From the fact that the city is expending large sums of money daily in the purchase of equipment and in the construction of a distributing system within the city, prompt action on your part is necessary."

In presenting such proposition the committee states that it "is actuated by a desire to do full justice no less to the companies than to the city, and in naming the above price for your properties it has determined upon a very liberal figure which, in its judgment, represents the extreme amount that should be paid by the city therefor."

Chief Electrical Engineer E. F. Scattergood has presented to Mayor Woodman an analysis of the proposal submitted to the city by the power companies, in which he makes the following conclusion:

"I am absolutely unable to recommend the acceptance of any of the proposals of the companies in these negotiations. In the first place, the valuations placed by the companies on their properties are entirely too high, being between $3,000,000 and $4,000,000 in excess of any fair and reasonable value of the same, considered as going concerns, with a profitable business attached. The partial payment plan, as urged by the companies, would be highly detrimental to the best interests of the city, in that it would be an inexcusable waste of public funds, and would be prejudicial to the success of the municipal power project, in that it would impose a lien of approximately $9,000,000 upon the properties that should be held by the city with clear and unincumbered title. As to the proposed power contract between the city and the companies, the demand that the city should buy 50 per cent of all power it should need for ten years at 1.41 cents per kilowatt-hour, when the city can produce it at approximately one-third of that amount, is grossly excessive and unfair to the city, and is but part of a clever plan to mulct the city out of approximately $10,000,000 for alleged severance damages.

"While I feel that the properties of the companies should be purchased by the city, if they can be obtained at a fair and reasonable price, and even that the city should deal very liberally with the companies in determining the amount to be paid to them, yet I am firmly of the opinion that any amount in excess of $10,000,000, or any power contract with the companies more burdensome to the city than that proposed by your committee, would involve positive and substantial injustice to the people of this city."

Foreign Markets for Electrical Goods

While the Bulk of American Export Trade at Present Is with Canada, South America and Japan, the Rich Markets of the Far East Remain Practically Untouched

By R. A. Lundquist

Special Agent of the Bureau of Foreign and Domestic Commerce of the Department of Commerce

THOUGH American manufacturers of electrical goods are now enjoying a period of exceptional prosperity, and are manifesting a commendable willingness to enlarge the scope of their activity through the acquisition of foreign business, they are, as a matter of fact, securing only a small percentage of the export trade that should properly be theirs. To insure an adequate and firmly rooted development in the future, two things are essential: First, the American makers must base their calculations on the obvious fact that many of their present orders from abroad are the result of the great dislocation in world economics produced by the European war. Second, they must strive diligently to adapt their output to the special desires of purchasers in distant lands; they must study with care and cultivate with discretion the vast foreign markets in which their endeavors should logically be rewarded by a gratifying and permanent success.

Our exports of electrical machinery, appliances, and materials have increased 57 per cent in the last two years. The latest available figures are as follows: Seven months ended July 31, 1914, $12,630,559; similar period, 1915, $13,170,367; similar period, 1916, $19,930,-130. Taking the normal year, 1913, with exports of $26,773,000, we find that about $9,000,000 went to Canada and about $5,000,000 to South America, the two making up more than one-half of the total electrical exports. Japan and its possessions took about $2,440,-000 of the remainder. This leaves only about $10,000,-000 worth of our electrical goods that were sold throughout the rest of the world. Exports to Australia and Tasmania during this period amounted to $1,115,-000, to New Zealand $217,000 and to the great, developing country of China a meager $120,250.

The situation is this: The export trade that our electrical manufacturers have to-day is bulked in Canada, South America and Japan. And the last-named country is beginning to make electrical goods of its own, and not only to supply its own needs to a certain extent but also to meet the electrical manufacturers of the world in open competition in foreign markets. Japan is bringing its electrical goods into South America, into China, into Australia, and even into our own country.

Far Eastern Markets Untouched

It is apparent from the above figures that the rich markets of the Far East, especially, are practically untouched by our export trade in this line. Moreover, our electrical manufacturers have laid no foundations for the future upbuilding of an export trade with these countries as they develop electrically. But there is, among such manufacturers, a rapidly-growing appreciation of the opportunities presented for developing a strong export trade, and a keener realization of the absolute necessity for doing this and doing it at once.

A national association of electrical manufacturers, with a membership of about 250 representatives and associate representatives, recently mailed a questionnaire to each member company. This questionnaire requested the views of the member on foreign trade. The replies showed that 85 per cent of the manufacturers desire to develop export trade. At the present time it is estimated that not more than 5 per cent of them have any appreciable foreign business, and those that are now actually exporting are not furnishing any great amounts of the markets overseas.

Notwithstanding the fact that their plants are operating now at their utmost capacity in practically all cases, and that in their best judgment they will be almost equally busy for at least two years to come, these executives still feel the necessity of extending their markets. With the changing world conditions, they must look for new markets, and the most promising field is abroad.

No Serious Attempt Made to Market Goods

Many of these manufacturers have filled, or are filling, a certain number of foreign orders. In the majority of cases, however, the orders that have been received have been the result of inquiries made by foreign purchasers who were forced by war-time conditions to place orders wherever they could get them filled within a reasonable length of time. A few companies, to be sure, have for some time made a vigorous effort to secure export business, but on the whole it may be said that, outside of the larger electrical manufacturers who have established branch plants or offices abroad, little has been done in the way of a serious attempt to sell American electrical goods in foreign markets. A great many of the manufacturers have indicated their willingness to receive orders from abroad by appointing agents in foreign countries, but in most cases it appears that (before the war, at least) the principal result of their efforts was to place their prices and data in the hands of representatives of foreign manufacturers.

Under existing conditions, therefore, we have the situation of foreign buyers coming to our manufacturers and expressing an urgent desire for our electrical products. We have not sold these in competition. The purchasers from abroad simply must have goods, and our manufacturers took the orders to the extent of their ability to deliver them.

Also, in probably the majority of cases the foreign purchasers have had to take whatever our manufacturers could furnish them, and at our own terms. They have been forced to accept our standard apparatus and supplies, even though their purchases were to be used where standards and conditions were entirely different from our own. To a certain extent this gives our manufacturers an opportunity to develop a demand for our American standards, but it is questionable whether certain export fields, such as Latin America and China, will be able to develop electrically if they are compelled to accept only the higher-quality, and accordingly higher-priced, American standard apparatus and materials. For some time past Australia, New Zealand and South Africa have demanded materials of good quality, but it is at least doubtful whether the Latin American market can be educated away from European electrical goods (which are generally cheaper than ours and inferior to them) to such an extent that our manufacturers, supplying the market with standard products used in American construction practice, can on that basis retain the export trade they have already built up and are apparently continuing to increase.

Many manufacturers seem to regard the present commercial conditions as normal. But in reality the present

market is somewhat abnormal, and if they would retain the trade that is now theirs they must plan earnestly and judiciously for the future. By determining the requirements of the different markets and meeting them without undue sacrifice of manufacturing efficiency, they must lay foundations now upon which to build the structure of their export trade.

The foregoing does not mean that some of our electrical manufacturers have not already sought to meet the special requirements of their foreign customers. For instance, one manufacturer has developed a line of sockets, receptacles and switches that have met with great success in South America, replacing similar European devices. This has not required a complete new line of special parts. In the socket, for instance, the outer shell and two porcelain items are new. The rest of the socket is made up of standard pieces such as are used in the ordinary grade of American socket. Comparing it even superficially with a European socket, it is at once apparent that the American product is superior. The manufacturer increases the production of his standard parts to a great degree, and still meets the requirements of this particular foreign market. His socket is actually far better than the European article, which formerly had the sale, and the manufacturer declares that he will be able to meet European competition in normal times, in spite of cartel-system buying and selling, long-time credits, etc., provided he is not placed at a disadvantage in the purchase of his raw materials.

MARKET FOR MOTORS BEING INVESTIGATED

In the apparatus line, also, manufacturers' associations are studying the requirements in the export markets, and developments are being made in the motor field with the view of furnishing standard lines rated in the same manner as are European motors. In export trade the practice of European manufacturers has been to submit motors rated on the basis of the maximum output, while in this country the practice is to give ratings that allow overload. This has naturally placed our manufacturers at a disadvantage in certain markets.

As a result of the questionnaire previously referred to, which indicated that 85 per cent of the members of a manufacturers' association are on record as desiring to build up an export business, it is evident that our American electrical manufacturers are awakening to the possibilities of the broader markets. In the last two years they have experienced a period of tremendous activity. Their plants have been extended and their working forces increased. Through the effect of the European war not only has their domestic and foreign business been expanded far beyond peace-time limits, because of the military demand for materials of all classes, but, in addition, they have been called upon to supply markets that, prior to the war, were controlled by belligerent countries.

With the end of the war conditions will naturally change, and for these economic readjustments our manufacturers must be effectively prepared. Conditions to-day afford no dependable indication as to what may occur in the future when European manufacturers are again in full competition with our electrical factories in the export markets. It may reasonably be assumed that our production will fall off, at least temporarily. The extent of such a decrease will depend upon how soon, and how well, our electrical manufacturers take advantage of their unusual opportunities and meet the present and future demands of the purchasers abroad.

When an electrical manufacturer who has studied his foreign business is asked why he seeks export trade he may explain his position by tracing an up-and-down curve in space, saying that foreign business "smooths out his production curve." He has found that it tends to fill in the "valleys" in his production curve without increasing the "peaks." This, it need scarcely be said, is the condition that the manufacturer desires. The low sections of his production curve mean lowered manufacturing efficiency. If he can fill in the "valley" without material increase in the "peaks," he increases his annual output with the same general overhead expense, this last being practically the same whether he is operating at 75 per cent of his capacity or at 100 per cent. The more he can run his plant at full capacity, the more he spreads his overhead charge and the lower the production cost. Foreign trade broadens the field from which the demand for his product comes. The broader the field the more uniform is the demand, the better the "load-factor" and the lower the cost of production.

Then again, there is the result of a broadened market that is akin to the practice of "spreading" investments. Because of local factors, economic conditions may be better in certain places than in others, and this again helps in steadying the demand. This is very apparent here in the United States. When crops are good in the Northwest, that section of the country offers a good market for manufactures of all kinds, though business may be slow in other sections. Naturally, manufacturers who cultivate the whole United States as a market feel the effects of such conditions far less than those who market their goods in only a few states. The same steadying effect is noted through the development of foreign trade.

Again, in certain lines, export business has a stabilizing effect that is due to seasonal conditions. The domestic market for electric fans, for instance, varies with the weather that prevails during the summer months. A year or two ago, when the United States, in general, experienced a cold, rainy summer season, a great many manufacturers suffered greatly because the sale of fans was only a small percentage of the normal demand. They had the stock ready for the market as usual, but were compelled to carry a great proportion of it over to the next season. In some cases manufacturers were to some extent relieved through the fact that their jobbers had to carry the stock over. Abroad, weather conditions were more nearly normal, and the development of foreign trade would have relieved the situation somewhat. Also, whereas the domestic demand is practically all confined to the summer season, an export business in the tropics would make for a greater uniformity of production.

The dollars and cents value of export trade to American electrical manufacturers is apparent. They need only to study and to supply the requirements of foreign purchasers as they do those of our own country. The markets are open to development, and the American electrical manufacturers can and must develop them.

Large Demand for Japanese Goods

The European war has had the effect of increasing demands from China and India, and also from Russia for wire and cable of Japanese manufacture according to the Japan *Chronicle*. The demand for domestic requirements has also increased, chiefly as a result of a revival of activity in general electric enterprises and the government extension of the telephone service.

In addition to wire, electrical apparatus is being manufactured very largely. Since the war began it has been very difficult to import dynamos, and Japanese manufacturers have endeavored to make the larger class of dynamos that were formerly imported. This ambition, it is reported, has now been achieved.

Incandescent Lamp Policy of Edison Companies

Report of Lamp Committee Gives Statistics on Performances of Lamps, Shows the Purchases Made by Member Companies and Deals with Policy Association Should Follow in Using Lamps

ONE of the most influential if not the most important working committees of the Association of Edison Illuminating Companies is the lamp committee. Drawing from experiences of member companies, from tests made for them and from observations in the field at large, its work is authoritative, exhaustive and instructive. Close contact with manufacturers of lamps also enables it to acquire first-hand knowledge of all developments consummated or in contemplation. While the report itself is only intended for member companies

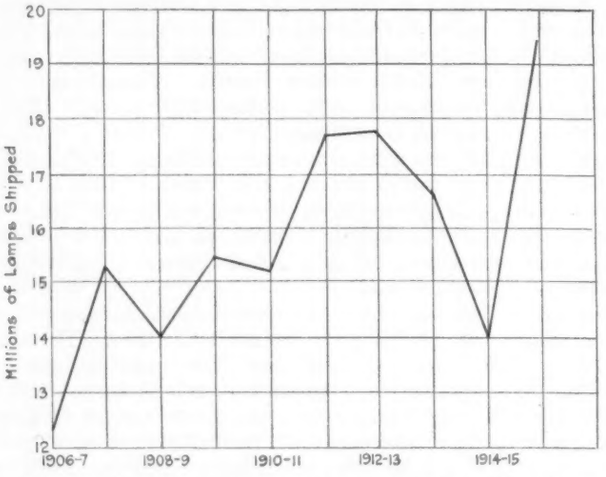


FIG. 1—ANNUAL LAMP DEMAND OF MEMBER COMPANIES

and is invariably read to them in closed session, we are enabled through the courtesy of the chairman of the committee to present in abstract some of its important features and recommendations.

The early part of this year's report was devoted to an analysis of member companies' demand for incandescent lamps, showing distribution among types and sizes. Fig. 1 shows the total demand for all types and sizes expressed in number of lamps shipped.

Fifty-four of the seventy member companies who are located in the United States obtained their incandescent lamps subject to test, their purchases amounting to about 93 per cent of the total lamp purchases of the entire association membership.

Detailed statistics of test results including acceptance tests applied prior to purchase and life tests upon samples of lamps shipped show that 15 per cent of all lamps were individually examined and tested for physical defects, while 2.6 per cent of all lamps were photometered in the course of acceptance tests.

Efficiency ratings for "Mazda" vacuum lamps have not been altered during the past year, and no rating specifications for "Mazda C" lamps are as yet agreed upon. The rating of "Mazda C" lamps in general, however, is inferior to that of "Mazda B" lamps.

Attention is called in the report to the ½-watt appellation applied to gas-filled lamps abroad, and it is pointed out that this is a misnomer, being attained only in the largest, most efficient, compensator types, and only then when the specific consumption is expressed in watts per mean horizontal candle-power of the lamp.

The extensive life-testing performed during the past year for the member companies has indicated that in general the useful life of "Mazda" lamps equals the guarantees put out by the manufacturers. In a few of the less important sizes there has been a shortage, though in no case has this assumed serious proportions.

AGING PERFORMANCE

It will be recalled that "Mazda" vacuum lamps are issued by the manufacturers before the aging process is completed, and that the lamps do not at first yield their true initial candle-power. Typical performance during the first few minutes of burning until this stable value is attained is illustrated in Fig. 2 for the more important sizes of lamps.

DIVERSITY OF PERFORMANCE

In Fig. 3 the dots indicate the hours of failure of individual lamps and the estimated candle-power just prior to failure.

Lamps of smaller sizes manifest a tendency to burn out during the earlier hours, while lamps of larger sizes tend to continue in service for a longer period with lesser candle-power values than those shown in the diagram. Typical performance of "Mazda" lamps of one size is shown in Fig. 4.

BLUE BULB OR DAYLIGHT LAMPS

Following are test statistics of the so-called "daylight" lamps:

	150-Watt Size	300-Watt Size
Initial candlepower	63%	65%
Useful life	74%	64%
Total life	less than 70%	75%

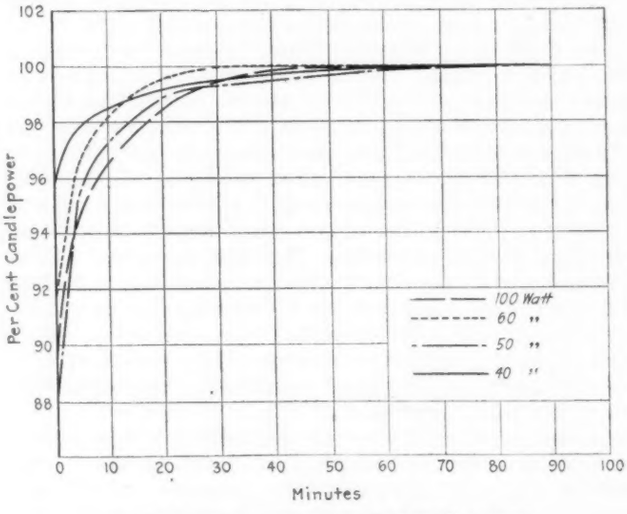


FIG. 2—AGING CURVES OF "MAZDA" LAMPS

The report featured a discussion of means of reducing the brightness of filaments by the employment of either diffusing glass bulbs or coated bulbs. It discussed likewise the possible employment of tinted diffusing bulbs for the same purpose.

The report closes with a discussion of the present status of operating voltage standardization and a survey of member companies' lamp practice covering all activities, from the ordering of lamps, through their receipt and operation in service, to the final scrapping

of the lamps after use. Some matters of general import included in the report are as follows:

STANDARDIZATION OF LAMP SIZES

In the estimation of the committee the adoption of the 50-watt "Mazda" lamp resulted in a finer gradation of sizes than appears to be desirable. It occurred to the committee and to the manufacturers that an excellent range of sizes for future standardization would consist of 15, 25, 50, 75 and 100-watt lamps. Some advance has been made in this direction. The 20-watt lamp, long considered a supernumerary, has experienced a reduced demand. Already the use of the 50-watt lamp has decreased the demand for 40-watt lamps and 60-watt lamps. Made available after the beginning of the past year, and only now being adopted by many member companies, the 50-watt lamp has already succeeded in making a considerable place for itself on Edison circuits. If its use can be promoted in place of the 40-watt lamp, the Edison companies may retire the latter from service. The new 75-watt gas-filled lamp fits in a vacancy in the desirable future gradation which has just been outlined. This range appears to be within reach, and the most important immediate step toward its adoption appears to be the promotion of the use of the 50-watt lamp. This lamp was urged upon the consideration of Edison companies as desirable of adoption as the standard central station lamp for general use.

OBJECTION TO CONCENTRATED FILAMENT LAMPS IN SMALL SIZES

The large size "Mazda" gas-filled lamps are very largely employed within diffusing enclosures which reduce the high brilliancy of the filament. Small concentrated filament lamps, whether of the vacuum or the gas-filled type, are more likely to be used without such protection. Thus misused, the committee says, they are a source of glare, and operate to the detriment of electric lighting by reducing its pleasing qualities and giving rise to complaints. Also the concentrated brightness of such filaments is likely to prove misleading in

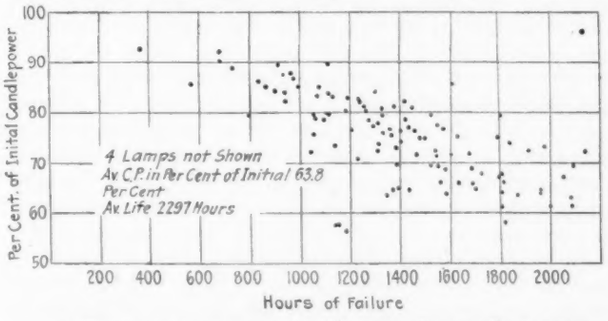


FIG. 3—ULTIMATE LIFE OF 40-WATT "MAZDA" LAMPS

that the light production appears to be greater than is really the case. Thus inadequate illumination may be provided from sources which are misjudged as being excessively powerful. In the estimation of the committee it would appear to be to the interests of all concerned to do everything possible to prevent the general use of small size concentrated filament lamps with exposed filaments.

FLUX RATING FOR ILLUMINANTS

Previous reports of the committee have discussed the theoretical advantages of rating in terms of total flux of light. Each year these advantages appear to be more important. The development of the gas-filled incandescent lamp has brought the practical necessities of the case before the Edison Association in a manner which will not be denied. During the past year the manufacturers have embodied either mean spherical candlepower or total lumens in their published lamp data in place of mean horizontal candle-power, and have expressed efficiencies in lumens per watt. It appears that the use of light flux with the lumen as the unit is imminent. If this change in practice is to come, the committee suggests that the Edison companies might

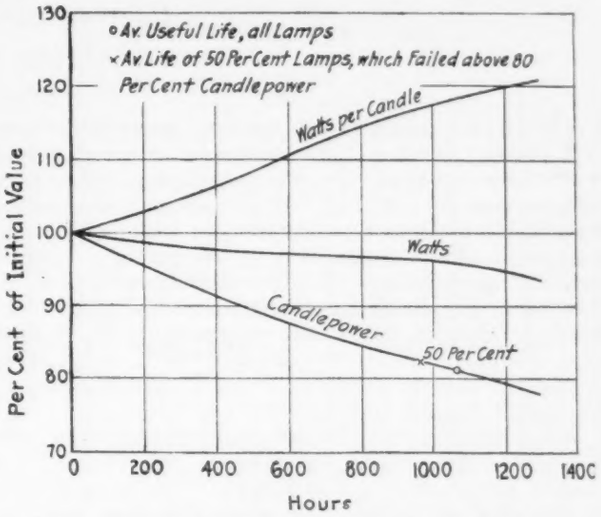


FIG. 4—PERFORMANCE OF 50-WATT "MAZDA" LAMPS

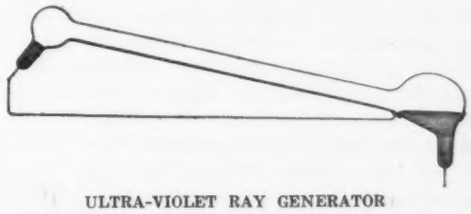
as well promote it and secure the advantages of the more logical and scientific rating as soon as possible. The committee restates its recommendation of last year that member companies familiarize themselves with the new units and gradually bring them into practice.

The personnel of the lamp committee is as follows: J. W. Lieb, New York Edison Company, chairman; C. L. Edgar, Boston; W. W. Freeman, Cincinnati; Samuel Insull, Chicago; Joseph B. McCall, Philadelphia, and Thomas E. Murray, New York.

An Ultra-Violet Ray Generator

Peter Cooper Hewitt discloses in patent No. 1,197,629 what is claimed to be an exceedingly efficient form of ultra-violet ray generator. The efficiency of a vapor electric apparatus as a source of ultra-violet rays depends to a great extent on the material of which the negative electrode is composed when its vapor serves to carry the current. By employing thallium or cæsium in a vapor electric apparatus, a large proportion of rays having a wave length of 2000 to 4000 microns is found to be emitted.

The exhausted container has a chamber at one end and a mercury electrode, and at the other end a re-



ULTRA-VIOLET RAY GENERATOR

cess containing an electrode of thallium or cæsium with a starting band and lead-in wire. The starting band is connected by a conductor with the lead. The electrode acts as an anode and the other electrode as a cathode. As the passage of current through the device vaporizes the thallium or cæsium, this material gives off ultra-violet rays under the influence of the current, which rays may be utilized for the various sterilizing purposes or for promoting chemical and physical action in solid and liquid substances.

Rewarding Ably-Managed Public Utilities

Application of the London Sliding Scale and Other Plans for Bringing Out Efficiency in Central Station Management

BY SAMUEL W. FLEMING, JR.
Of the Firm of Farley Gannett, Consulting Engineer, Harrisburg, Pa.

A PUBLIC service commission engineer recommended certain improvements costing several thousand dollars for the power plant of a small eastern electric company. The manager also recommended the changes to carry out the work, and money was borrowed with the help of the personal indorsements of stockholders. The results were so gratifying that the utility wrote an enthusiastic letter to the commission thanking it for the suggestion. In a short time, however, the utility was directed to lower rates, so that the gain in operating economy was offset by the enforced reduction in rates.

The manager then followed his operation costs more closely and found that by spending $1,500 he could effect a saving of several hundred dollars a year. But he had had his lesson, and when the same engineer made another inspection and suggested this further change the manager refused to consider it.

In the manager's opinion it is not proper to spend the company's money and add further to the responsibility of the stockholders if the expenditure does not benefit the latter. The company takes the risk of losing its investment and the owners of the property assume greater responsibilities by putting out more notes and bonds against the property to no purpose.

A conscientious executive feels responsible both to the community he serves and to the company that employs him, but his work and initiative should not result in benefit merely to the community.

This attitude, perhaps, is not as public spirited as it should be, but it is a natural and perfectly human attitude. Without exception it is safe to say that men operating properties sincerely desire to improve service and lower rates constantly, provided the company's interest is safeguarded. If there were a proper incentive to better operating conditions, utility managers would be continually urging their directors to raise money for improvements.

A bonus system for utilities has been suggested and partially tried. Broadly it means sharing the economies resulting from able management between the company and the community under the supervision of public service commissions. There has been a recent decision in a western state permitting a company to capitalize the favorable location of its power plant at the mouth of a coal mine to the extent of sharing this advantage with the community. If thus encouraged to effect economies by building large power plants where coal is cheapest other companies will be able to offer lower rates to consumers and return higher dividends to stockholders. If there had been no recognition of the claim to capitalize plant location, there would be little incentive for others in that state to take a similar step, involving large investment in new power plant equipment.

Several bonus methods have been worked out in Great Britain, principally for gas companies. For example, a standard price for gas and standard rate of return are established, and as the price of gas is reduced there is allowed a corresponding increase in rate of return to the stockholders. A similar method to reward efficient operation has been adopted in connection with the Boston Consolidated Gas Company. In 1905 the Massachusetts Legislature appointed a committee to study the so-called "London sliding scale," and in 1906 applied it to the Boston Consolidated Gas Company. Gas at 90 cents and dividends at 7 per cent were fixed as standards. For every 5-cent decrease in price of gas there is allowed a 1 per cent increase in rate of dividends. The price since 1907 has been 80 cents per 1000 cu. ft. of gas and dividends generally have been at the rate of 9 per cent since that time. The trial period of ten years has just terminated.

Last March the Board of Gas and Electric Light Commissioners for Massachusetts recommended that the act of 1906 be declared void unless certain changes were made in the provisions of the act. The writer believes the board was influenced in its conclusions by the intricate organization of the corporation in question, with its constituent and holding companies. The point has been raised that there may be a tendency under a sliding scale system to always pay out dividends to the limit that a reduction in rates permits, even if by so doing at times maintenance and depreciation reserve are skimped. For the continuance of the sliding scale system the board recommended certain changes in the provisions of the act, among them three-year instead of ten-year periods for establishing standards, and also additional power on the part of the board over the regulation of the system. However, in spite of this recommendation the Legislature declined to interfere. The matter may come up again next year.

General opinion in Great Britain is favorable to the sliding scale, for it has been almost uniformly successful there. It would not follow necessarily that the plan would always work the same way in other countries. There are inevitable differences in local conditions, traditions and characteristics. Nevertheless it is true the world over that good service follows able management, and able management exists where it is recognized and rewarded. The reverse is also true that poor service is a result of poor management, and the latter is invariably found where ability is neither recognized nor rewarded.

It has also been suggested that regulating bodies rate companies periodically according to merit, and then grant them higher or lower incomes, depending on the rates and service offered. Each property manager is thus in competition with the records of previous years of his own property as well as the present and past records of other companies of the same character. Consumers and stockholders alike have a real interest in the ability of the management to make good. Inefficiency means lower dividends to the stockholder and no benefits to the consumer. Efficiency means higher dividends and lower rates.

These methods are by no means impracticable, but to work them out justly in practice requires a vast amount of analysis and study. The result, however, is worth the effort. If by spending $5,000 a small utility is able to increase its dividends by 1 per cent, and if a large company has to spend say $500,000 to attain a like result, each usually makes a wise investment.

If, however, the public service commission should say: "Your dividends are too high; you'll have to lower your rates," would there be any incentive to make any such expenditure? Would it not be fairer for a com-

mission to say, "We extend congratulations for your initiative. We believe able management should be rewarded, and we will allow an increase in your net earnings to the extent that the total saving is shared with the consumers"? Then the operating staff would be keen to put into effect further economies and, perhaps, in a short time rates could be lowered again.

The normal growth of business might not justify this 1 per cent increase in dividends in ten years. By that time the commission would lower rates to put the property on a 7 per cent basis, but the consumer would, nevertheless, have to wait the ten years to get the reduction in rates. If, on the other hand, a bonus system such as outlined were applied, a reduction of rates might be had in six months.

Although this may appear to be largely theorizing, there have been actual experiences similar to the one described above. Certainly there are wisdom and justice in a bonus system. It is used widely in other lines of industry, and could be just as well applied to obtain the best results in management of public service properties. Human nature cannot be regulated out of the operation of public utilities. Personality cannot be ruled out. Enthusiasm and efficiency of organization ebb and flow with the enthusiasm and efficiency of the directors and president and managers and superintendents. Consumers and stockholders alike recognize this principle and are thankful that regulating bodies recognize it. The latter should never be allowed to forget it.

An ably managed utility means one that is giving good service and earning money. One might substitute "is giving good service because it is earning money." If regulation ever becomes so strict that there can be neither recognition nor reward for able management there will not be able management. This means inadequate returns for capital and indifferent service.

City authorities and representatives of commissions believe in the wisdom and justice of rewarding initiative and use of brains, but are suspicious of the ones across the fence. Utility managers and stockholders across the fence are suspicious in turn of regulating bodies.

By personal contact each is learning that the representative of the other point of view is remarkably like himself. The more they work together the more the astonishing fact is brought out that the other fellow possesses qualities for which he is never given credit. If the bonus system is a stimulus to give improved service at lower rates why not apply it?

HYPOTHETICAL TABLE FOR ELECTRIC COMPANY

	No-Bonus System			Bonus System		
	Average rate per kilowatt-hour			Average rate per kilowatt-hour		
Period	Large Company, Cents	Small Company, Cents	Return on Investment, per Cent	Large Company, Cents	Small Company, Cents	Return on Investment, Per Cent
Start	3	7	6	3	7	6
Sixth month	2.95	6.9	6	2.75	6.75	6.5
First year	2.85	6.75	6	2.5	6.5	7
Ninth year	2.65	6.65	6	2.35	6.35	7.25
Tenth year	2.5	6.5	6	2.25	6.25	7.5

According to the hypothetical table shown herewith consumers will wait ten years under a no-bonus system to obtain lowered rates granted them in one year under a bonus system. Rates under a bonus system, moreover, will always be lower at any period than rates under the no-bonus system, so that offhand it would appear that it pays to reward ably-managed utilities.

Equipping Motor Trucks for Central Station Service

How Electric Service Companies Are Equipping Trucks for Lamp Installation, Maintenance and Trouble-Shooting Service

ASIDE from employing specially equipped motor trucks for performing underground and overhead construction work as outlined in the Sept. 30 issue of the ELECTRICAL WORLD, many central station companies are finding that they are specially useful in maintaining street lighting systems and answering trouble calls. While gasoline vehicles are being used in a number of instances for these services, it is under just such operating conditions as characterize this work that electric vehicles show their advantages. For example. stops are frequent, the radius of travel usually is not great, the periods between travel permit the batteries to recuperate considerably, electricity is available for operating portable lamps, tools, etc., and the maintenance or trouble men, instead of special chauffeurs, can operate the vehicles.

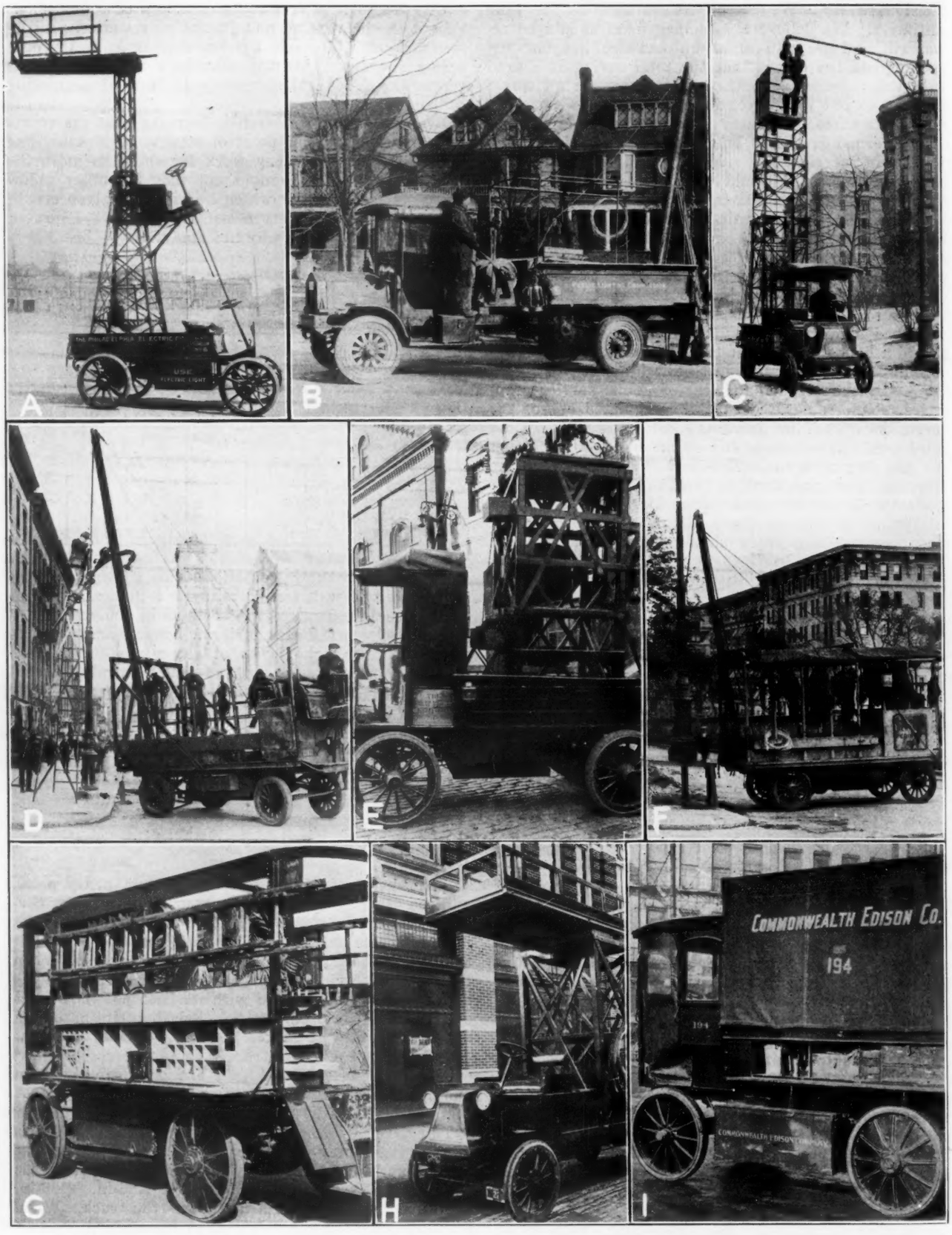
As an indication of how trucks can be equipped for street-lamp maintenance and emergency service the accompanying illustrations are presented, with brief descriptions of their constructions and methods of operation.

STREET LAMP INSTALLATION METHODS

In New York City the installation of lampposts has been considerably facilitated by the use of trucks equipped with derricks and motor-driven winches. Two types of this equipment are shown herewith, one having a latticed steel stiff leg for erecting tall, heavy poles, and the other having a shorter wooden derrick for correspondingly shorter and lighter pole erection. Not only are these derricks used for erecting the poles, but also for unloading them from the delivery trucks. When the smaller derrick is used for erecting tall poles, the standard is usually placed with its base near the point of erection and raised into position about its base as a support. With the larger derrick, however, the conduit forming the core of the post can be erected first and the base, column and lamp bracket hoisted in turn and lowered over the conduit. The maximum weight that can be lifted with the steel derrick is about 700 lb.

This derrick consists of two 4 in. by 5.25 in. channels latticed together to form a column 26 ft. long. About 6 ft. from the lower end are attached two steel braces which with the boom are hinged to a 6-in. by 6-in. angle iron running across the tail of the truck. When erecting poles the boom is held in an inclined position by two head guys and two rods connecting the lower third point with a structural frame attached to the truck chassis.

A 12-in. sheave and steel strap block with a similar diameter are provided at the outer and hinged ends of the boom respectively to guide a 2-in. manila used in hoisting. When the truck has to pass under low clearances the brace rods can be detached from the



Lamp Maintenance, Trouble-Service and Lamppost Erecting Trucks

A—Lamp trimmers' tower truck which can be driven from either seat and which is equipped with worm-drive hoisting motor (Philadelphia Electric Company); *B*—Truck equipped with derrick and motor-driven winch for erecting lampposts (Public Lighting Commission, Detroit); *C*—Three-section motor-operated telescoping tower truck (New York Edison Company); *D*—Portable steel derrick with motor-operated hoist (New York Edison Company); *E*—Motor-operated tower truck (New York Edison Company); *F*—Tower equipped with winch and wooden boom (New York Edison Company); *G*—Overhead-service truck showing compartment for carrying supplies (Commonwealth Edison Company); *H*—Lamp maintenance truck with offset platform (St. Joseph, Mich., Railway, Light, Heat & Power Company); *I*—Direct-current district emergency truck (Commonwealth Edison Company).

boom, a rope attached thereto and led over the tackle block, shown suspended from crossbar over the tail of the truck, to the winch drum. Then with the head guys released the boom can be lowered by letting out the rope on the winding drum. It may be pointed out that stiff legs are usually placed under the tail of the truck when using the derrick to transfer the load directly to the ground.

LAMP MAINTENANCE TRUCK

For cleaning lamps and maintaining street units in operating condition, trimming trees around lamps, etc., the New York Edison Company makes use of several types of tower trucks, two of which are shown herewith. The towers on both of these are elevated and lowered by motors operated from the vehicle battery, thus saving considerable of the time which is usually wasted in performing this operation manually. Limit switches are provided to prevent over elevation and so the truck cannot be moved unless the tower is collapsed. In addition to this safety precaution wire deflectors are attached to the top of the steel tower cage to protect the tower man in case the truck passes under low-hanging wires. Motor control switches are placed so that the towers may be operated from the cage or driver's seat. Some of the truck towers are equipped with revolvable offset platforms for attending lamps hanging inside curb lines.

FIG. 1—ELECTRIC TRUCK PULLING UNDERGROUND CABLE, USED BY COMMONWEALTH EDISON COMPANY

TRUCKS EQUIPPED FOR EMERGENCY SERVICE

For taking care of trouble calls in the outlying overhead districts of Chicago, the Commonwealth Edison Company has recently installed in this service three Ford chassis with special bodies. These supplement six electric trucks used in this service and are utilized to facilitate the clearing of trouble in the far-outlying territory where the roads are bad, runs long, speed an important factor, and in general, where the limitations of the electric trucks make their use less practicable. The Ford bodies are built with a cabinet on each side, providing compartments and bins for various sized bolts, linemen's tools, rubber goods, fuses, insulator trays, etc. A 100-amp., 6-volt storage battery is carried to operate an 8-in. automobile searchlight mounted on the dash, which is effective in locating trouble at night without climbing poles.

The rear axles of these cars are specially reinforced so that a large part of the weight of the body and load is transmitted directly to the rear wheels, the axle being thus relieved. The wheels themselves are also reinforced by plates at the hub and the cars are thus made suitable for the rather heavy service required. Small transformers are carried on these vehicles at times.

The electric trucks used in overhead emergency service are being re-equipped with bodies very similar to the Ford bodies, replacing an earlier design less suited to the service. These electric trucks are Walker 0.5-ton machines. Both the electric vehicles and the Fords are provided with tarpaulin coverings.

Trouble calls in the direct-current district are handled with a 2-ton Walker electric truck. This is equipped with a body into which are built numerous compartments, bins and drawers to store the necessary equipment, tools, spare parts, etc., for making emergency repairs on junction boxes and either cable or Edison tube mains. The truck is equipped with manhole screens and guards, jumper cables for keeping customers in service during repairs, a ladder, galvanized iron pump, digging tools, fuses and miscellaneous parts and all equipment necessary to work on 110-220-volt live conductors. Two extension cords and 80-volt lamps are provided as part of the equipment. They may be connected with plugs mounted on the machine and operated from the vehicle battery for illumination when night work is necessary. A small battery hand lamp is also carried for quick inspection work. This truck is on duty night and day and is kept either at the underground division tool room or adjacent garage. It is placed on charge as soon as it comes in from any run at all, so that it is practically always fully charged.

A fleet of sixteen 3-ton White trucks is being used by the Cleveland Electric Illuminating Company. Tower trucks of the same make are employed by a Massachusetts company for service comparable with lamp maintenance.

The New York Edison Company makes use of electric trucks in the underground construction department which are equipped so that a cable pulling line can be led out from the front, from either side or from the rear of the truck, thus permitting the truck to be placed so it will least obstruct traffic. The winch is installed below the chauffeur's seat. In addition, there are stanchions for winding and unwinding ⅜-in. steel rope over winch drums, cable wheels for mounting cable reels when cables are being pulled into conduits and skids to fasten to the tail of the truck for loading and unloading cable reels. All electric trucks are equipped with lamp leads from the storage battery so that light can be furnished to carry on work at night. When the truck cannot be kept on the job the leads are connected with the nearest street lamp.

For making short line extensions and service drops the Commonwealth Edison Company utilizes a specially constructed and equipped 3-ton Walker Electric Company truck. Like the truck used in underground cable work, mentioned in the Sept. 30 issue, it is equipped with a body into which compartments, drawers and bins are built for conveniently carrying the various materials, apparatus and tools needed. The compartments on the rear end carry the through bolts, those on one side, the crossarm bolts and other shorter bolts, brackets, salt pail, furnaces, etc. Those on the other side are equipped with nine trays bearing twelve pins each on which insulators may be carried. In addition there are other compartments on this side for rubber goods, linemen's tools, block and tackle, etc. One three-section extension ladder is carried on brackets on the side posts on one side and an alley-arm ladder on the other.

A feature of convenience to the men in making out their reports and charge tickets is the writing board shown on the side next to the rear end post. The tops of the compartment sections form seats for the men going from one job to another. The tailboard when let down forms the rear steps into the body. The floor boards in the aisle are removable, so that access may be had to the storage battery. A tarpaulin is provided for covering over the entire body of the truck in bad weather.

The Benton Harbor-St. Joseph (Mich.) Railway & Light Company has equipped a 1-ton electric truck which is used by its line crew with a motor-generator charging set which permits the use of this vehicle for line work in country as well as in city construction. The truck can be charged at any transformer installation. The motor-generator set is rated at 2 hp., 110 volts on the motor end and 40 amp., 80 volts on the generator end. The arrangement of this unit, together with the necessary starting and control apparatus just back of the driver's seat, is shown in an illustration published in the Aug. 26, 1916, issue of the ELECTRICAL WORLD, page 425. The cost of installing the charging set, including material and labor, was $135. This truck as equipped with a forty-cell Exide battery, together

FIG. 2—TWO ELECTRIC TRUCKS USED BY BENTON HARBOR (MICH.) COMPANY

The right-hand vehicle is for delivery work and the other one is for line construction service. The latter is equipped with a motor-generator set so the vehicle may be charged in the field, thus increasing its cruising radius.

with another which is used for light work by the company, is shown in Fig. 2.

Up to a short time ago the Southern California Edison Company disposed of its obsolete automobiles for the nominal sum of $50 to $100. Recently, however, the idea was conceived that the old cars might be converted into trailers for material and construction trucks. Carrying out this thought, six roadsters, which had been condemned on account of excessive operating cost, were dismantled of driving parts and suitable bodies provided. Incidentally, the operating mechanisms were sold for more than had been obtained previously for the entire vehicle. These trailers were painted with a distinctive color and sent to different districts where they are used in conjunction with automobiles having a ca-

FIG. 3—EMERGENCY-SERVICE TRUCK USED BY THE NEW YORK EDISON COMPANY

pacity of 1500 lb. or less. It may be pointed out that these trailers impose a much smaller load on the power truck hauling them than would ordinary wagons with sleeve bearings and steel-tired wheels, and may be run at much higher speeds.

While these trailers allowed room for men on the motor truck, and permitted transporting more material than could be handled formerly, they are not suited to carrying very large transformers because of the height of the bodies and the load rating. With these limitations in view, new trailers have been constructed as follows: The rear axle is 4⅛ in. by 4⅝ in. in cross-section, while the corresponding wheels are equipped with 42-in. by 12-in. rubber tires and the largest Timken bearings obtainable on the Coast. The front axle is 3.75 by 4 in. in cross-section and arched. Suspended below these axles so as to clear the ground by about 10 in. is a bed which is 15 ft. long by 4 ft. wide and made of 1.5-in. by 6-in. clear maple flooring supported by frames which consist of 6-in. by 8-in. Oregon pine timbers.

The first load carried consisted of three 400-kva. transformers weighing 8300 lb. each carried on the trailer and 2 tons of transformer oil in drums transported on the motor truck. This load was hauled by a 2-ton truck having a gear ratio of 9 to 1.25 from Ocean Park to Los Angeles in four and one-half hours. Except on one small hill the truck was operated on high gear. From an examination of the road over which the load was hauled no mark could be noticed from the tires. One special advantage that obtains from the use of this trailer is the elimination of many expensive shipping details.

For instance, instead of having to stencil each crossarm with the company's name, as is required when transporting them by freight, they are now carried by truck. Extra labor is also avoided with transformers, as to insure safety against breakage they have to be crated for freight shipment, but do not have to be for truck transportation.

August Output Record Breaker

Central Stations Sell During Month 1,880,000,000-Kilowatt-Hours for Which the Income Was Approximately $31,000,000

DURING the month of August last the energy output from the central stations of this country, according to the returns received by the ELECTRICAL WORLD from more than 60 per cent of the industry, was larger than in any previous month in the history of the industry. This output amounted to 1,880,000,000 kw.-hr., which is larger than any previous month's output by 15,000,000 kw.-hr. In comparison with August, 1915, this output was a gain of approximately 300,000,000 kw.-hr., or more than twice the monthly output of the combined New England States, a gain of 25 per cent.

On the other hand, the August income was less than that for the previous months, although the rate of growth was comparable. August earnings amounted to approximately $31,000,000. This is a gain of 15 per cent or roughly $4,000,000 in comparison with the August, 1915, earnings.

TABLE I—CENTRAL-STATION RETURNS FOR TWELVE-MONTH PERIOD

	Percentage of Industry Represented	Income from the Sale of Energy			Kw.-Hr. Output		
		1915	1914	Per Cent Increase	1915	1914	Per Cent Increase
Sept.	65	18,547,170	17,074,927	8.6	1,003,606,094	871,573,412	15.1
Oct.	65	20,112,813	18,329,490	9.8	1,087,786,658	949,288,459	14.7
Nov.	65	21,899,048	19,720,232	11.6	1,150,669,073	948,704,941	21.3
Dec.	64	23,418,774	20,962,264	11.8	1,230,655,404	1,004,108,399	22.5
		1916	1915		1916	1915	
Jan.	65	25,286,336	22,352,721	13.2	1,200,672,452	984,205,683	22.0
Feb.	65	22,133,485	19,175,537	15.3	1,121,452,738	869,537,132	29.1
March	65	22,027,627	18,722,742	17.8	1,212,363,217	969,888,339	25.2
April	64	21,206,946	18,375,014	15.5	1,137,602,995	920,464,917	23.1
May	64	20,345,529	17,559,786	16.0	1,170,143,766	944,681,881	24.0
June	64	20,254,732	17,551,769	15.4	1,170,679,212	968,724,416	21.0
July	64	19,553,225	17,108,992	14.3	1,152,166,978	955,067,459	20.8
Aug.	63	19,373,315	16,852,939	15.0	1,186,552,930	950,313,758	25.0

The tremendous gain in output was noticeable throughout the entire country, particularly so in New England. According to the returns the New England States apparently took a tremendous jump in power load in the month of August. The combined output, however, of this section is considerably smaller than that of any other section of the country, and a new fac-

TABLE III—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR UNITED STATES—CITIES GROUPED BY SIZE

	Nov.	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.
INCOME:										
Group 1	9.8	10.2	10.7	14.1	16.0	13.9	14.4	14.9	13.8	13.6
Group 2	12.8	13.8	21.3	20.0	18.5	17.0	17.5	17.7	17.2	20.0
Group 3	18.0	19.8	18.3	20.7	28.1	24.7	26.2	21.8	19.5	20.5
Group 4	11.9	13.6	13.1	15.7	17.3	17.4	15.1	11.0	8.9	12.1
Group 5	13.0	13.0	7.2	18.5	26.5	16.1	24.0	15.3	12.2	16.0
OUTPUT:										
Group 1	17.0	19.0	19.0	25.4	22.0	20.0	21.3	18.7	18.7	21.5
Group 2	29.0	31.5	28.0	40.6	28.1	25.5	18.0	17.5	23.5	34.7
Group 3	36.0	33.0	33.2	39.6	39.0	37.7	40.0	21.8	27.8	31.3
Group 4	18.0	16.3	22.6	29.7	18.2	22.7	23.0	19.3	16.0	28.3
Group 5	13.4	9.7	8.5	22.4	29.9	32.0	33.2	19.0	11.6	17.6

TABLE IV—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR NEW ENGLAND STATES—CITIES GROUPED ACCORDING TO SIZE

	Nov.	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.
INCOME:										
Group 1	13.8	14.8	16.5	18.0	21.5	16.0	17.0	16.4	12.6	9.6
Group 2	12.7	16.1	15.4	19.9	19.0	21.2	19.5	19.8	20.6	16.5
Group 3	15.5	22.8	22.1	29.7	38.7	15.5	24.0	18.2	21.2	14.0
Group 4	9.0	9.6	11.3	15.1	18.1	13.2	13.5	7.2	6.2	11.5
Group 5	13.7	23.5	20.6	26.3	54.5	27.6	27.0	21.7	14.9	17.5
OUTPUT:										
Group 1	28.7	26.2	29.0	38.5	30.9	25.0	28.2	30.0	19.2	31.3
Group 2	30.0	26.5	26.0	36.8	27.8	31.4	33.2	26.3	14.1	35.4
Group 3	23.0	22.5	39.5	41.6	49.0	38.1	43.0	15.0	31.4	48.0
Group 4	20.1	18.5	15.0	23.0	17.4	36.1	30.0	21.0	26.6	53.5
Group 5	51.0	14.5	22.6	25.6	58.7	71.8	54.4	31.7	13.5	21.3

TABLE II—CENTRAL-STATION RETURNS BY SECTIONS OVER A TWELVE-MONTH PERIOD

	Month	Percentage of Industry Represented	New England States			Percentage of Industry Represented	Atlantic States			Percentage of Industry Represented	Central States (Illinois Excluded)			Percentage of Industry Represented	Pacific and Mountain States		
			1915	1914	Per Cent Increase		1915	1914	Per Cent Increase		1915	1914	Per Cent Increase		1915	1914	Per Cent Increase
INCOME	September	66	2,162,064	1,949,663	11.0	68	7,288,842	6,904,245	5.5	57	5,285,358	4,691,751	12.6	88	3,664,215	3,387,717	8.2
	October	66	2,327,214	2,073,059	12.3	68	8,096,982	7,550,808	7.2	57	5,820,653	5,153,314	13.0	88	3,798,012	3,477,051	9.3
	November	66	2,472,539	2,188,049	13.0	67	8,894,805	8,158,589	9.0	57	6,342,582	5,554,226	14.2	88	4,069,995	3,703,124	10.0
	December	66	2,817,557	2,448,813	15.0	67	9,335,396	8,529,866	9.4	57	6,983,909	6,063,349	15.1	88	4,150,045	3,773,810	10.0
			1916	1915			1916	1915			1916	1915			1916	1915	
	January	66	2,819,144	2,432,177	15.0	67	9,589,347	8,564,488	12.0	57	7,834,831	6,717,799	16.6	88	4,182,114	3,823,156	9.4
	February	66	2,599,760	2,185,967	18.8	67	8,978,797	7,854,345	14.3	57	6,660,062	5,568,337	19.7	88	3,761,364	3,443,182	9.3
	March	66	2,595,777	2,122,177	22.0	67	8,998,962	7,660,667	17.5	57	6,470,612	5,394,250	20.1	88	3,787,925	3,386,286	11.9
	April	64	2,221,544	1,898,749	17.0	67	8,794,056	7,596,567	15.8	56	6,289,092	5,292,974	19.0	88	3,825,701	3,520,381	8.8
	May	65	2,103,585	1,788,219	17.0	67	8,226,231	7,131,063	15.4	56	6,085,407	5,123,132	18.7	88	3,874,270	3,469,871	11.6
	June	65	2,208,994	1,906,233	16.0	67	8,045,839	6,905,114	16.5	56	6,007,742	5,143,452	16.9	88	4,017,208	3,539,137	13.5
	July	65	2,130,684	1,875,824	13.7	67	7,832,928	6,731,106	16.3	56	5,838,779	5,014,185	16.4	85	3,636,814	3,381,978	7.6
	Aug.	60	2,062,522	1,806,416	14.4	65	7,709,844	6,621,832	16.4	55	5,866,201	4,998,427	17.3	85	3,685,288	3,380,588	9.0
KW.-HR. OUTPUT	September	66	74,835,203	63,716,224	17.3	68	358,765,971	319,549,780	12.3	57	286,893,057	247,046,941	16.1	88	279,133,989	237,795,633	17.5
	October	66	82,568,951	69,882,867	18.3	68	400,516,741	353,685,472	13.3	57	305,962,017	268,972,416	13.7	88	292,885,613	251,095,356	16.8
	November	66	87,193,883	69,359,620	25.8	67	420,584,253	355,151,259	18.5	57	333,528,905	269,870,536	23.7	88	301,772,412	248,913,893	21.0
	December	66	99,744,195	80,446,521	24.1	67	447,158,465	373,213,316	20.0	57	363,859,444	293,266,707	24.1	88	311,034,100	249,996,678	24.5
			1916	1915			1916	1915			1916	1915			1916	1915	
	January	66	97,072,794	77,029,974	26.2	67	431,201,554	356,809,437	20.8	57	362,121,067	284,407,361	27.5	88	301,645,060	258,982,414	16.5
	February	66	92,855,679	68,982,535	34.8	67	411,715,612	320,924,478	28.1	57	339,326,360	252,816,291	34.1	88	268,653,564	220,662,826	22.1
	March	66	97,321,924	74,958,898	29.9	67	439,660,902	349,347,454	26.0	57	360,872,072	282,179,673	28.0	88	304,327,753	255,450,143	19.3
	April	64	84,769,660	64,816,830	30.8	67	403,223,021	326,574,302	23.4	56	344,866,175	273,367,413	26.4	88	302,386,347	253,778,348	19.2
	May	65	84,719,642	64,318,892	31.8	67	409,529,049	333,585,886	22.0	56	345,860,257	275,328,229	25.6	88	328,793,909	266,599,708	23.2
	June	65	87,829,797	69,506,884	27.6	67	396,630,887	327,541,507	21.2	56	350,015,166	288,982,024	21.2	88	328,996,553	277,915,476	18.6
	July	65	85,317,206	71,160,365	19.8	67	401,179,678	333,771,509	20.2	56	345,480,295	282,625,397	22.1	85	308,668,330	260,430,191	18.6
	Aug.	60	91,483,834	67,159,659	36.2	65	420,995,398	335,306,199	25.5	55	352,680,966	279,313,072	26.5	85	319,674,420	267,140,952	19.7

tory of any considerable size placed upon central station lines would make an appreciable impression on the comparative figures.

Another rather hopeful sign for the month of August is to be discovered in the Far Western States. With the month of May registered as the climax for growth, returns for succeeding months showed less percentages

TABLE V—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR ATLANTIC STATES—CITIES GROUPED BY SIZE

	Nov.	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.
INCOME:										
Group 1	7.6	8.3	11.1	13.7	16.7	15.1	14.5	16.4	16.8	16.0
Group 2	15.0	14.0	18.2	18.4	21.2	18.5	21.7	21.9	18.5	23.6
Group 3	10.0	13.1	11.9	14.6	20.5	15.3	17.7	12.0	14.2	15.0
Group 4	14.4	15.3	17.4	19.4	17.9	19.5	14.0	15.4	10.0	14.7
Group 5	14.6	12.2	16.0	15.8	12.2	15.6	13.0	15.2	13.0	19.4
OUTPUT:										
Group 1	16.0	20.1	21.1	30.8	29.2	26.1	25.5	13.1	23.4	28.6
Group 2	26.6	25.5	26.4	33.4	25.6	35.6	11.3	31.8	27 4	33.8
Group 3	22.1	16.6	20.1	22.0	16.0	13.7	18.0	13.2	11.5	15.4
Group 4	22.0	18.9	15.6	21.8	20.9	19.0	12.6	19.7	16.3	29.9
Group 5	18.6	20.6	1.5	24.0	13.1	8.9	35.0	11.1	13.5	20.4

of growth in comparison with previous years. For August, however, the growth curve assumed a rise. Whether this is a flash in the pan or is indicative of what is to come is not known.

August totals bring those for the year to Aug. 31 up to an income of $265,000,000 and an output of more

TABLE VI—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR CENTRAL STATES—CITIES GROUPED BY SIZE

	Nov.	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.
INCOME:										
Group 1	17.0	15.8	14.3	18.3	19.3	18.2	18.0	16.4	15.8	16.0
Group 2	10.8	9.8	25.5	20.5	19.1	18.0	17.4	17.5	17.8	22.5
Group 3	24.0	25.1	24.3	27.0	23.0	26.7	27.2	20.5	18.6	17.5
Group 4	19.8	18.3	9.6	20.2	22.9	22.8	24.1	17.5	17.6	13.4
Group 5	9.6	18.0	5.7	11.1	14.4	9.4	21.3	12.6	6.1	13.2
OUTPUT:										
Group 1	22.0	21.9	24.9	30.3	25.2	24.7	25.0	23.8	21.0	23.7
Group 2	21.5	31.0	28.8	44.0	32.3	23.9	19.5	12.3	26.9	38.9
Group 3	43 0	41.2	32.5	44.0	40.6	43.5	41.0	31.8	26 0	24.6
Group 4	36.7	18.5	53.4	41.0	31.9	39.2	38.5	31.3	21.3	16.3
Group 5	17.3	20.6	13.3	15.9	19.1	10.1	14.7	4.0	8.6	7.3

than 14,500,000,000 kw.-hr. The growth in income for the first eight months of the year as compared with the first eight months of 1915 is 15.3 per cent, and in output, 22.6 per cent. Estimates based on the foregoing figures place the income for 1916 at well over $400,000,000 and an output of over 22,000,000,000 kw.-hr.

TABLE VII—PERCENTAGE RATE OF INCREASE IN INCOME AND KILOWATT-HOUR OUTPUT FOR PACIFIC AND MOUNTAIN STATES—CITIES GROUPED ACCORDING TO SIZE

	Nov.	Dec.	Jan.	Feb.	Mch.	April	May	June	July	Aug.
INCOME:										
Group 1	7.5	6.0	11.6	6.7	8.5	3.9	7.2	7.5	4.5	5.3
Group 2	15.7	17.3	†	†	18.7	3.5*	2.3	1.2	0.6*	0.7
Group 3	20.0	24.6	19.7	22.0	28.1	40.0	39.0	39 5	28.3	32.5
Group 4	4.3	10.8	3.0	8.2	17.5	11.7	13.8	3.6	1.0	6.0
Group 5	13.5	3.9	10.5	17.8	26.3	12.0	19.1	12.8	13.2	14.4
OUTPUT:										
Group 1	9.9	13.1	9.1	13 0	22.7	8.0	12.0	8.0	10.2	10.9
Group 2	51.0	56.0	†	†	28.3	3.6*	2.2	1.0	2.0	6.5
Group 3	67.0	67.0	56.0	68.8	39.0	80.0	79.0	74.5	56.1	57.5
Group 4	6.2	10.5	1.8	13.8	18.6	10.3	21.8	10.0	4.0	8.7
Group 5	8.3	1.0	1.0	20.1	30.0	11.7	17.5	16.0	10.8	16 3

*Decrease. †Results omitted owing to insufficient returns.

The current year thus promises to be head and shoulders above any previous year in the history of the industry. Coming on the heels of lean years as it did, in which the central stations to maintain a growth were forced to extend their new business operations to the limit, the present year in many localities is one of striking contrast. In many localities, the old question of obtaining the business has given place to the new question of handling the business as it arises. Power loads of tremendous proportions have been demanded practically over night and have taxed generating apparatus to the utmost. New equipment has been necessary but in countless cases it has not been possible to obtain it. Such a condition has led to central stations in different sections of the country having to refuse certain business on the grounds that it could not furnish service.

Of course, it must be understood that this latter condition is not general, because the amount of new equipment that has gone into central stations during the cur-

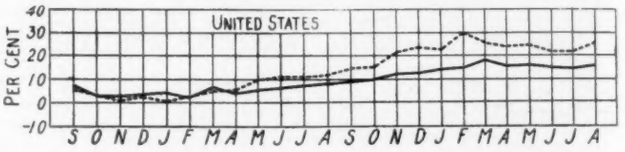
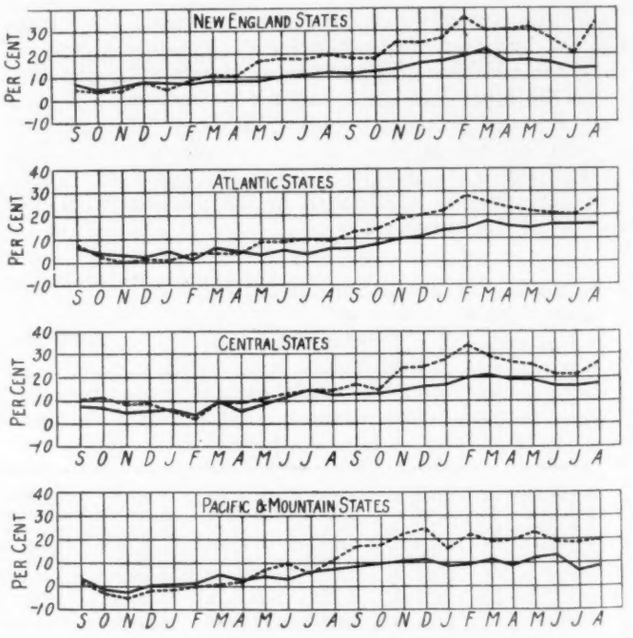


FIG. 1—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT FOR UNITED STATES

rent year has reached astonishing proportions. It has been estimated by the ELECTRICAL WORLD that during the current year 3,000,000 kw. in steam turbines represent the manufacturers' 1916 business with central stations, while in water turbines a rather conservative estimate of 500,000 kw. has been made. Leaving out of consideration gas and oil apparatus, these figures would indicate that the central station generating capacity will be increased during the current year by almost 50 per cent.

The accompanying curves show graphically the percentages of growth both in income and output contained



FIGS. 2 TO 5—CENTRAL STATION INCOME AND OUTPUT GAIN BY MONTHS IN PER CENT SECTIONALLY

in Tables I and II. The remaining tables show the percentages of growth both in income and output for the companies grouped sectionally according to the size of the communities they serve. Group 1 includes those companies operating in cities of more than 100,000 inhabitants. Group 2 includes those companies operating in cities having populations between 50,000 and 100,000; group 3, those operating in cities between 25,000 and 50,000; group 4, those cities between 10,000 and 25,000, and group 5 in cities between 5000 and 10,000 inhabitants.

STATION AND OPERATING PRACTICE

A Department Devoted to Problems of Installation, Operation and Maintenance of Equipment for Economical Generation and Distribution of Electrical Energy

BASIS FOR MOTOR SPECIFICATIONS

How Steam-Engine Indicator and Integrator Are Combined to Approximate Requirements of Motors Replacing Reciprocating Engines

BY J. H. SCHAKNE
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Ordinarily when the mean indicated horsepower of any reciprocating engine has to be ascertained indicator diagrams are taken every few minutes and the corresponding speeds observed. The results of such tests, while correct for the particular engine cycles studied, will be only approximate for average conditions and may even be widely different if the load varies considerably or if the engine is an internal-combustion unit which receives varying impulses during non-periodic intervals.

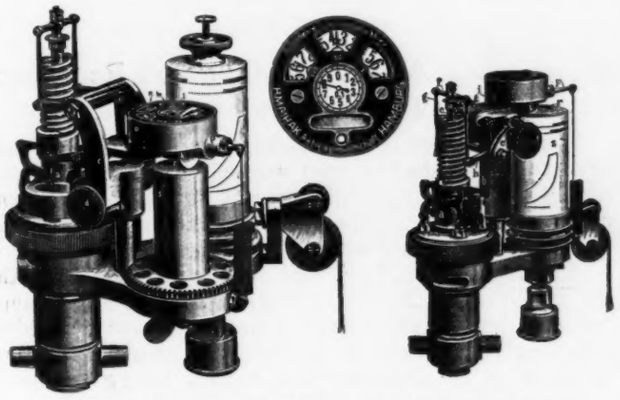


FIG. 1—COMBINED INDICATOR AND POWER INTEGRATOR IN TWO FORMS

Continuous diagram indicators which record instantaneous cylinder pressures over periods of several minutes have been developed to overcome these objections, but few of these instruments indicate the engine speed corresponding to each cycle and the diagrams are generally difficult to interpret because the lines are intangled, as shown in the accompanying reproduction of a continuous diagram. Following one particular test made by the writer in which such indicator diagrams were taken, it required almost two months' time and the efforts of four men to work up the performance of a machine driving a 42-in. three-high blooming mill from a continuous diagram covering only a one-hour period. Since that time continuous diagram indicators have been developed, which have the advantage that the lines do not cross due to the exhaust lines being drawn in the same direction as the expansion lines but use of such diagrams also involves the personal accuracy of obtaining the exact speeds and areas of each diagram.

Because of the aforementioned objections the writer has recently employed two instruments in conjunction with each other which will give the mean horsepower directly. The equipment consists of a Maihak indicator combined with a Böttcher's "power counter" in two different forms. Both permit taking single cycle diagrams during the period of operation, but one permits changing the diagram sheet while the counter is in motion. An unlimited number of check diagrams may therefore be obtained. With both types, the "power counter" proper shown in Fig. 1 is fastened to a standard, *b*, firmly fixed to the spring holder *a* of the indicator. The standard top *c* is held firmly against the standard by the wedge screw *d*, which may be loosened by hand. Movement of the piston rod *e* is transmitted to the counter casing *i* by the crosshead *f*, the

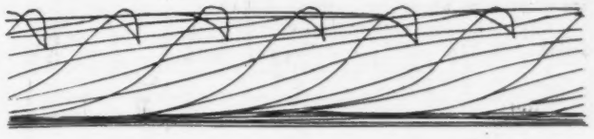


FIG. 2—SECTION FROM A CONTINUOUS DIAGRAM INDICATOR CARD

connecting rods *g* and the arm lever *h*. This casing contains a mechanism which measures the diagram in much the same manner as a planimeter, but does so automatically and while the instrument is being used. In this case, however, the working wheel *k* bears on the top of drum *r*, rotation of *k* being transmitted by gears to dial pointers *l*, *m*, *n* and *o* reading in tenths, units, tens and hundreds, respectively. Since the casing *i* to which wheel *k* is attached moves transverse to the axis of the drum with changes in cylinder pressure, the wheel *k* revolves at a speed proportional to the distance from its contact point to the axis of the drum. Thus at zero cylinder pressure the wheel contact is at the axis of the drum and does not revolve.

Indicated horsepower can be computed from the power counter readings by means of the formula: Indicated hp. $= KZ \div T$, where Z is the difference in readings observed during any interval, T is the length of the interval in minutes, and K is a constant composed of

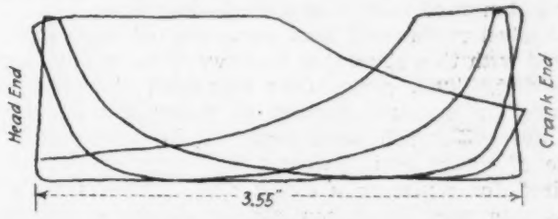


FIG. 3—SINGLE-CYCLE INDICATOR CARD USED TO DETERMINE "POWER COUNTER" CONSTANT

In taking this card an 80-lb. spring was used and the indicator constant was 15.5. Since the mean area is 697 sq. in. and the engine stroke 5 ft., the power counter constant is $(697 \times 15.5 \times 5 \times 80) \div (3.55 \times 33{,}000) = 36.7$.

several other constants appearing in a development of the fundamental equation for indicated horsepower. The derivation is as follows:

$$\text{Ind. hp.} = \frac{PLAN}{33{,}000} = PL(D^2 - d^2)\,\frac{\pi}{4}\,N \div 33{,}000$$

since P = mean area of all diagrams $\times$ scale of spring (M) in pounds per square inch $\div$ length of diagram of base (S), then $P = (CZM) \div (SNT)$, where C is the constant of the instrument given by the manufacturer, the meaning of the other symbols having been given previously. Substituting this value in the first equation:

$$\text{Ind. hp.} = \frac{CZM}{SNT} \times L(D^2 - d^2)\,\frac{\pi}{4}\,N \div 33{,}000$$

Since for any test, however, all of the symbols except Z and T are constants, they can be combined into one constant K and the Ns cancelled out, making the equation reduce to Ihp. $= KZ \div T$ the form given previously.

Fifteen months experience with this apparatus has demonstrated that the equipment can be employed to secure accurate data in steam plants where the load is continuously changing. Furthermore, the instrument permits ascertaining the energy required during a given cycle of any operation, therefore the total energy consumption for any period may be computed by multiplying the value thus obtained by the number of cycles which will occur during that period. It is not necessary to know the speed of the engine being tested when

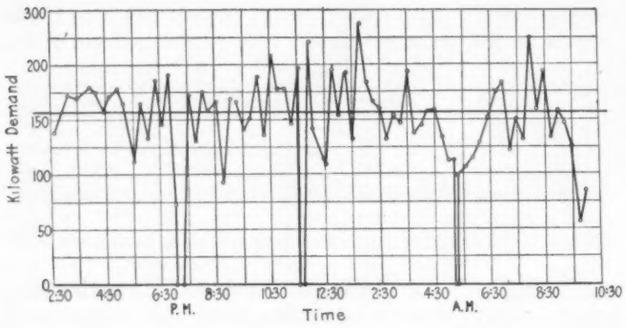


FIG. 4—RECIPROCATING ENGINE LOAD CURVE OBTAINED WITH COMBINED INDICATOR AND POWER COUNTER

The engine carrying this load was a 30-in. by 60-in. Bates Corliss engine. One of the machines driven, a shovel mill, consisted of three stands—roughing, runover and finishing rolls. They were 34 in. in diameter and the metal rolled ranged in thickness from 1/16 in. to ¼ in. The other machine, a saw mill, consisted of two stands—roughing and finishing rolls. They were 26 in. in diameter and the metal rolled ranged in thickness from 0.014 in. to 0.25 in. Slightly over 39 tons of metal were rolled with an energy consumption of 3018 kw.-hr.

using this equipment since the number of revolutions are taken into account automatically in the records. The horsepower that is being developed at any instant may be ascertained by multiplying the counter reading by a constant which is different for each engine but can be computed in advance of the test. The accuracy of the apparatus has been found exact by comparing the counter readings during a constant load with results computed from single check diagrams.

A steel rolling-mill load curve plotted from data secured with this apparatus is shown in an accompanying drawing. This curve, data computed therefrom and figures on the total amount of material rolled during an average month were employed in determining the size of motor and flywheels, and type of control required for replacing a steam drive. The information was also used in estimating the energy consumption and operating cost per kilowatt-hour with electric operation.

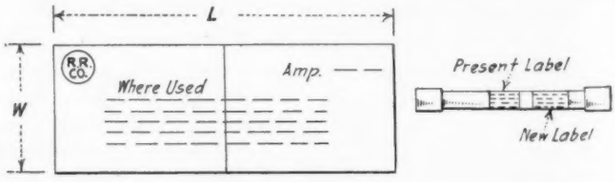
Emergency Cable for Restoring Interrupted Service

When a burn-out in any section of its secondary system is so severe that consumers affected thereby cannot be supplied with energy from another main in the same junction box, the New York Edison Company provides temporary service from an emergency cable. This consists of ordinary lead-armored cable, which can be laid along the street curb or building faces, and energized from some nearby manhole without endangering pedestrians or street traffic. The service lines are connected thereto by removing a section of the lead armor and insulation and covering the exposed parts of the new taps with bitumen or some similar insulating compound that is not easily injured by abrasion. It has been found impracticable to provide permanent taps at regular intervals, because the taps could not be made to correspond to the different spacings between houses, apartments, etc. Furthermore, it would be expensive to have enough specially equipped emergency cables for each district. Under the present arrangements any cable can be used, hence delays in restoring service are less liable to occur when it is found that a secondary section in unserviceable and emergency equipment must be secured in a hurry. The cables are delivered where they are needed by emergency trucks. By tapping old connections the cables may be used over and over for this purpose.

By this scheme many interruptions to service which might have required hours and even days to remedy have been "rid of their sting." For instance, sometimes a burnout in one cable will weld it to the duct or injure adjacent cables so that none of them can be used or removed quickly. Under such conditions the service taps are connected to the emergency cable, as previously explained, and the repair gang permitted to take its time in replacing the defective cables. These emergency cables are being used extensively along the site of the new subway now under construction in New York City.

How Labels Aid in Handling and Replacing Proper Fuse Sizes

A practical method for facilitating the handling and replacing of fuses has been worked out by E. D. Ransom of the Brooklyn Rapid Transit Company for use in railway work which may also be applied in power plant, line and maintenance work. To all external appearance 1-amp. and 10-amp. cartridge fuses are the same with the exception of the rating label. Where a large number of different fuses are used in the numerous circuits and types of equipment, the average employee cannot be expected to remember the correct rating for each



PAPER LABEL AND FUSE SHOWING LOCATION OF OLD AND NEW LABEL

circuit. The accompanying illustration shows a label which is placed on all fuses to aid in the selection of the proper size for any circuit. A table is used that shows the fuses of different ratings tabulated by number, color or size of label and the location in which each is used. For example, a 15-amp. fuse bears label No. 8. It is pink in color and is inscribed to show that it can be used with 22,000-volt potential transformers on No. 3 and 4 power lines and No. 3BX feeder line. The illustration shows the location of the label on the fuse, the method of attaching and instructions as to the division of coloring.

When fuses are ordered, this information is furnished the manufacturer, who properly labels all fuses before delivery. By the use of these labels the proper fuse rating is insured in its respective circuit by anyone who can read, regardless of his knowledge of the proper fuse required. In addition fuses are sorted and stored easily, as it is not necessary to stop and read the rating label.

Safeguarding the Public in Line Construction Work

Strict observance of regulations requiring the display of red flags and lanterns is enforced by the Greenfield (Mass.) Electric Light & Power Company in connection with all construction work. Whenever the load on a company vehicle extends over 3 ft. from the rear, a red flag is conspicuously fastened at the extreme rear end of the load by day and a red light by night. The company does not allow street-lighting fixtures to be lowered on a highway without first placing a flag or lantern under the light on the roadway. When running wire on a highway, a red flag is placed at each end of the job, and when crossing intersecting streets with conductors a red flag is placed at least 50 ft. from the corner of the intersecting streets. In trimming or cutting trees on a highway, the company places a red flag at least 25 ft. on each side of the danger zone and also on the sidewalks. Also when blasting on the highway a man is sent in both directions on the roadway and on intersecting streets within 200 ft. of the blasting point.

Oil Troubles with Hydraulic Governors

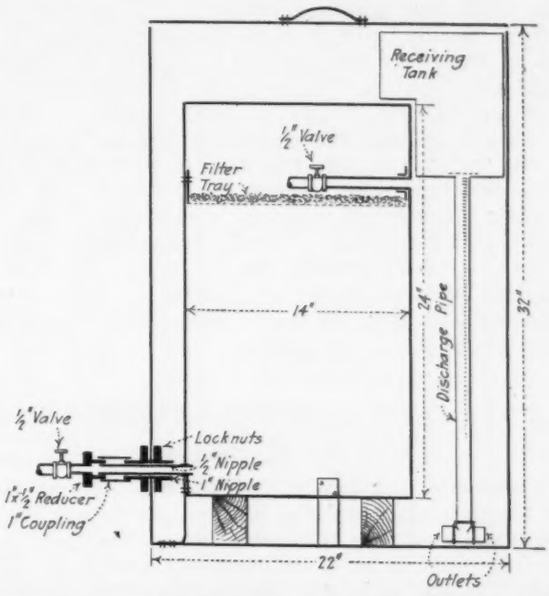
BY R. H. LEWIS

Oil pressure governors for medium sized water wheels are, as a rule, reliable devices and give operators little trouble due to the mechanism itself. In the plant with which the writer is connected, however, trouble has been experienced with sticking of pilot valves due to a deposit in the oil. The deposit is apparently caused by some action taking place in the oil when air was pumped through it by the pressure pump. The pressure pump was arranged to work all the time circulating the oil that was passed by the governor and a small amount of air. Excessive pressure was prevented by a safety valve. The oxidized oil which formed the deposit was much like the carbon found in gas-engine cylinders. Very fine particles occurred first, and later developed into quite large pieces. To keep the larger particles out of the delicate valves of the governor, strainers and a special grade of governor oil were used. In addition one-quarter of the oil in each governor system was passed through a fine milk strainer every other day. Even with this attention, however, the oil system had to be thoroughly cleaned and fresh oil substituted every ten months.

After running nearly two years in this manner the pressure pumps were changed to the "open system," in which the suction of the pump is closed tight when the oil in the tank reaches the proper pressure. The pump then runs idle until the pressure drops to about 20 lb., when it is again cut in and allowed to pump the oil which has been passed by the governor back into the pressure tank. After the proper pressure is reached the cycle is repeated. In this way very little air is pumped into the oil system, and the safety valve never discharges under normal conditions. Since a small amount of deposit still showed in the oil with the "open system" in operation, an oil filter was made as shown in the accompanying sketch.

The filter consists of a galvanized-iron tank somewhat larger than a barrel in which a smaller tank is employed to hold the clean oil that passes through the filter tray. The latter is made with sheet iron sides and has ¼-in. mesh sand screen on the bottom. On this rests one thickness of light cloth covered by about ¾ in. of cotton waste and another cloth. This produces good results as a filtering medium, and is easily changed when necessary. The receiving tank holds about two pails of oil. A strainer is employed over the discharge pipe leading to the bottom of the large tank. The large tank acts as a settling tank, the oil rising up to the level of the pipe leading to the filter tray to be filtered. This filter allows one or two pails of oil to be thrown in and filtered slowly, thus removing practically all the small particles of oxidized oil. About one-eighth of the oil in each governor system is filtered daily.

The filter has been in use for nine months, and during that time no trouble has been experienced due to



CONSTRUCTION OF OIL FILTER FOR USE WITH GOVERNOR SYSTEMS

dirty oil. The valves and inside of the pipes remain bright and clean. A special grade of governor oil was used at first, but now ordinary generator oil, after it has been used in ring-oiled bearings, is passed through the filter and used in the governor oil system to make up the loss from filtering, etc.

Regulation of Water Level in Boilers

Abrupt changes in the firing of a steam boiler are uneconomical and should be avoided as far as possible. Such changes in the condition of the fire as are demanded by the fluctuations of load should be made gradually, so as to minimize the waste of heat. The same is true of the water-level regulation, particularly in the case of boilers which carry a load that may vary between wide extremes in a short time, such as boilers serving a street-railway power plant. A moment's consideration will show the importance of a logical plan of adjusting the water level to the changes of load. Safety fixes the two limits between which the water level may be allowed to vary, and about midway between these practice has set a normal level, which firemen are usually instructed to maintain. Such instructions may very easily be carried out when the load is steady, inasmuch as the opening of the feed valve can be made great enough to admit water to the boiler at the same rate at which evaporation is taking place. But when the load curve reaches a sudden peak, common sense must be brought into play.

The effect of an increase of load is an increased demand for steam, which in turn involves an acceleration in the rate of evaporation. This must be met by increasing the rate of combustion so as to supply the extra heat needed. But the addition of fresh fuel

would momentarily deaden the fire and reduce the rate of evaporation rather than increase it. The better plan, therefore, is to draw upon the heat that is stored up in the water. This can be done by reducing the influx of cooler feed water, so that the heat that is generated in the furnace will be utilized, for the greater part, in converting the hot water into steam. The water level will fall as this drain on the stored water is felt, but by the time that the low-water level is reached, the peak may be passed; or if not, sufficient time will have elapsed to enable the fires to be brought up to a condition in which the heat generated will more than meet the increased demand. If, then, the load falls off rapidly, with the fires burning fiercely, the excess of heat over that needed to supply the required steam may be stored in the water, by opening the feed valve and raising the water level above the normal. Hence, the rational and economical method of regulating the water level is to run it up at light loads and let increased evaporation reduce it at heavy loads, thus utilizing the body of water as a reservoir of heat energy. Such regulation naturally spells greater activity on the part of the fireman; but he may as well face the fact that modern conditions impose on him greater responsibilities than the mere maintenance of a desired steam pressure.

Chart for Determining Flow of Water Through Pipes and Friction Loss

By means of the accompanying chart the velocity of flow through pipes and the friction loss therein can be determined with only one correction for length of service. The chart is based on an analysis made by Gardner S. Williams and Allen Hazen, consulting engineers, who have found that the velocity of flow is not strictly a function of the square root of the hydraulic radius and the slope. Assuming that water is to flow through a 24-in. pipe at the rate of 10,000,000 gal. a day, the friction loss and velocity can be found as follows: Starting at the left-hand margin with the rate (10,000,000 gal. a day), follow the horizontal line until it intersects the diagonal line marked with the diameter of the pipe (24 in.). Above this point will be found the friction loss (51 ft. per 1000 ft. of pipe). Starting again at the point of intersection and tracing the diagonal line downward to the right, the velocity (4.92 ft. per second) will be found in the bottom scale. The loss of head as given by this chart is based on pipe having a coefficient of 100 or which has been in service thirteen to twenty years. If the pipe is newer or in very good condition the loss in head should be multiplied by the factor given in the accompanying table opposite the years of service.

SERVICE CORRECTION FACTORS FOR USE WITH CHART

	Size Pipe (In.)															
Years' Service	4	5	6	8	10	12	16	20	24	30	36	42	48	54	60	Multiplying Factor
	26	28	30	33	35	37	39	41	42	43	44	45		46	47	1.56
	13	14	15	16	17		18	19				20				1.00
	4			5							6					.70
	Perfectly straight, new, very-best cast-iron pipe															.59
	Good new cast-iron pipe															.51

The chart which is reproduced on this page was prepared by the engineering department of the Allis-Chalmers Manufacturing Company of Milwaukee, Wis., and will be found very convenient in solving pipe line problems.

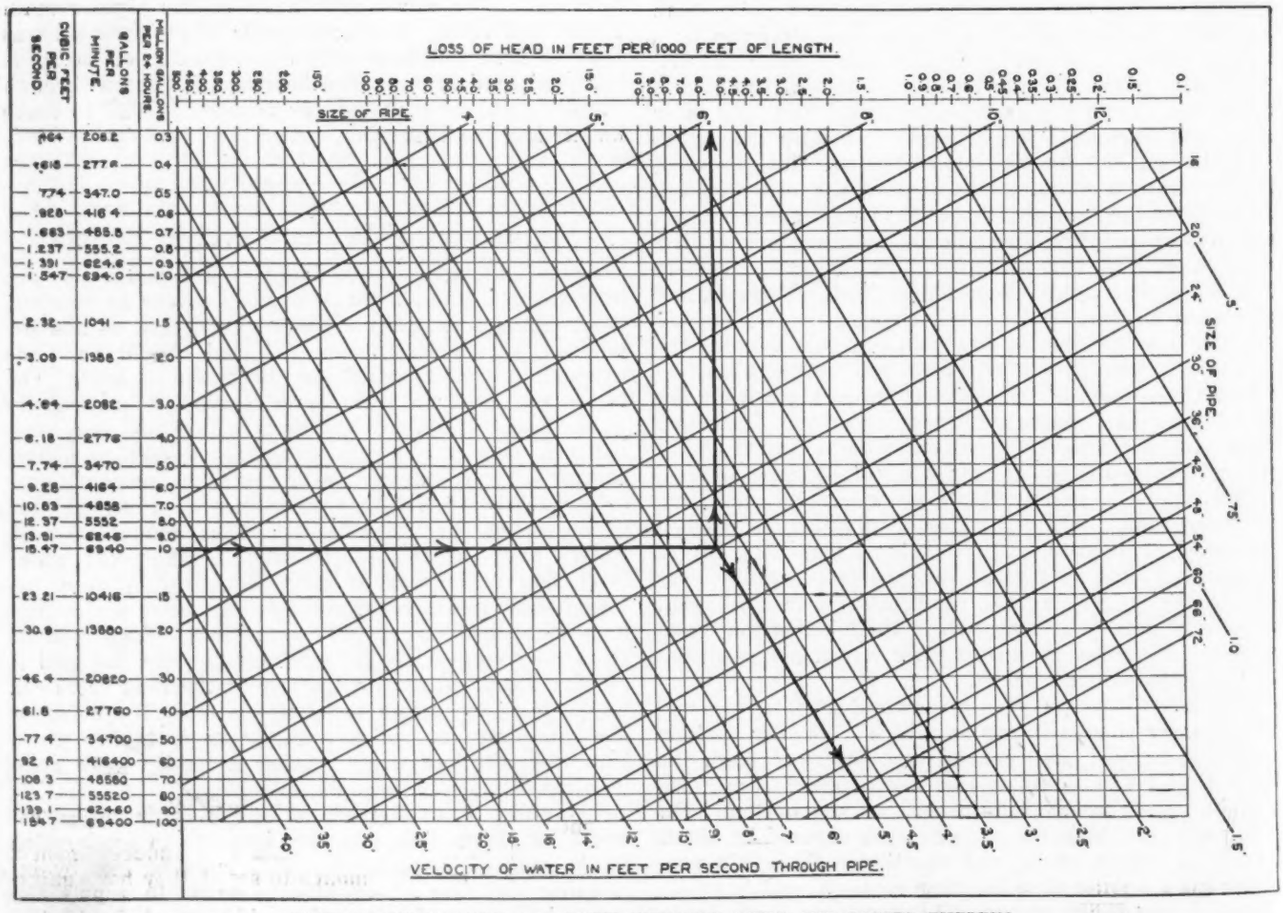

LOSS OF HEAD IN FEET PER 1000 FEET OF LENGTH.
SIZE OF PIPE
CUBIC FEET PER SECOND.
GALLONS PER MINUTE.
MILLION GALLONS PER 24 HOURS.
SIZE OF PIPE.
VELOCITY OF WATER IN FEET PER SECOND THROUGH PIPE.

DIAGRAM GIVING FLOW OF WATER THROUGH PIPES AND LOSSES THEREIN

COMMERCIAL AND BUSINESS POLICY

A Department of Plans and Methods for Widening the Application of Electricity and for Extending Electric Service

Customers' Payments Facilitated Through Use of Monthly Bills as Sight Drafts

At the present time nearly 800 customers of the Louisville Gas & Electric Company pay their bills for electric service without ever seeing the statements rendered by the company until the receipted vouchers are returned to them by the bank with their cancelled checks at the end of the month. Customers who adopt this "sight draft" plan of paying always get their discounts, and are, moreover, saved the trouble of remembering to pay their monthly bills.

The customer who wishes to avail himself of this convenience has only to fill out and sign the form printed on the slip reproduced herewith. The electric company then arranges to send monthly bills to the bank indicated by the customer.

The banks credit the company's account with the amount of the bill, and charge each customer's account with the amount. The main part of the bill is returned to the customer with his checks at the end of the month, receipted as "paid" by the bank, while the stub portion is returned to the company.

Customers do not waive any rights in questioning the correctness of the bills because they are paid.

"The arrangement is satisfactory to us for the reason that it insures payment of the bills on the first day of the discount period," explains L. S. Mayer, auditor of the company. "Moreover, it is a convenience to the customer because he always receives his discount and avoids the payment of postage and the trouble of addressing the envelop and making out a check to us.

"In order to reduce the confusion which might occur in handling these accounts, we use differently colored bills from those sent to other customers. The number of customers who pay in this way is increasing.

"We have received a number of letters asking for permission to use this system of collection, and we have granted this permission freely, requesting, however, that a different colored bill be used so that other bills will not be mixed with ours in going to the banks.

"The banks have raised no objection to the method. The only comment we have ever heard was that we should have the part of the bill which the bank is to retain and send to the customer with the checks made more nearly the size of a check, which could be done very easily if new forms were to be prepared."

Louisville, Ky._____
(DATE)

To_____
(NAME OF BANK)
Louisville, Ky.

Gentlemen:

Please pay to the Louisville Gas and Electric Company the net amount of their bills for gas and electric service rendered to me at_____and
(HOUSE NUMBER AND STREET)
at_____upon their
(BUSINESS ADDRESS AND STREET NUMBER)
presentation, and return the receipted portion of the bill to me with the paid checks drawn on my account.

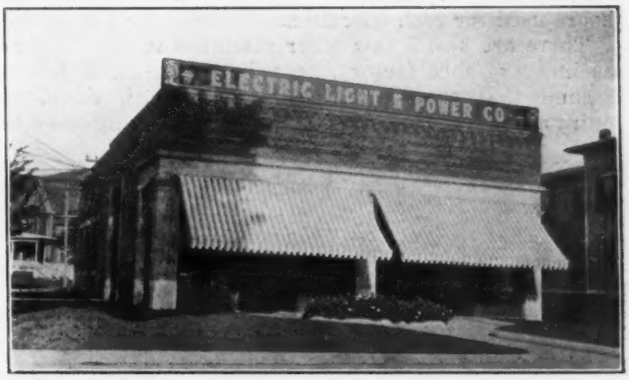
Yours very truly,

_____

FORM FILLED IN BY CUSTOMER REQUESTING HIS BANK TO PAY TO THE LIGHTING COMPANY AMOUNT OF MONTHLY BILLS RENDERED FOR ELECTRIC SERVICE

Combined Central Station Office and Substation

One of the most attractive central station district offices in Massachusetts is the recently-completed district headquarters of the Greenfield Electric Light & Power Company at South Deerfield, illustrated herewith. The office is a one-story brick and concrete building with a rear section devoted to substation use, and includes quarters for the local branch of the system distribution department. Spacious lawns and a well-kept flower bed



CENTRAL-STATION OFFICE AND SUBSTATION AT SOUTH DEERFIELD, MASS.

in front of the building add greatly to its attractiveness. The building is surmounted by a "Flexlume" electric sign 30 ft. long, equipped with 18-in. letters and lighted by fifty-two 25-watt lamps, the slogan of the Society for Electrical Development being neatly embossed at each end. The front of the building contains two well-stocked showrooms and the office of the local manager, Samuel H. Richards. The substation equipment consists of a 300-kw. motor-generator set, lighting and power transformers, etc.

Scales in Company Office Interest Customers Waiting to Pay Bills

The Schenectady (N. Y.) Electric Illuminating Company has placed a Toledo scale in its salesroom. People weigh themselves on the scale while waiting to pay bills and while standing about the salesroom waiting for friends who are buying. This scale gives visitors something to do while they wait, and even induces them to return at the end of a month to see if they have gained or lost weight.

Electricity Supersedes Steam for Heating Shoe Machinery in Brockton (Mass.) Factory

During a discussion at the Pittsfield (Mass.) convention of the New England Section of the N. E. L. A., D. M. DeBard of the Edison Electric Illuminating Company of Brockton, Mass., stated that after three years of continuous effort electrically heated machines have now been substituted for all machines requiring steam heat, in the factory of Condon Brothers, Brockton, Mass., making 700 pairs of men's Goodyear welt shoes per day.

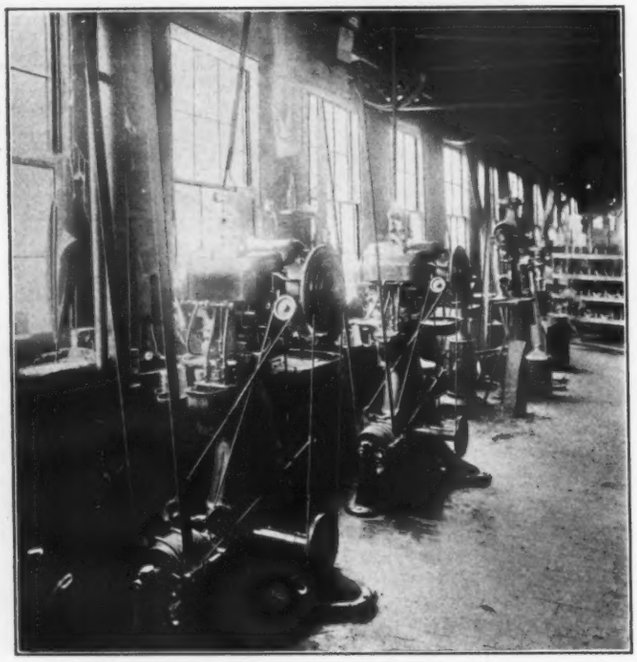
The machines electrically heated and their connected loads, are as follows:

Number	Machines	Kilowatts	Total Kilowatts
2	Goodyear stitchers	0.62	1.24
2	Goodyear welters	0.48	0.96
1	Bobbin winder	0.10	0.10
2	Pulling-over machines	1.47	2.94
4	Box-toe steamers	0.75	3.00
1	Bottom drier	2.28	2.28
1	Bottom filler	0.55	0.55
1	Gem insole machine	2.86	2.86
	Total connected load....		13.93

Curve-drawing instruments show the maximum fifteen-minute demand to be 13.86 kva.; power factor 95 per cent; maximum demand, 13.1 kw.; and load factor, 30.7 per cent.

A watt meter has been installed on each group of machines. Herewith is given a detailed record for July, August and September of shoes made and kilowatt-hours used for each operation.

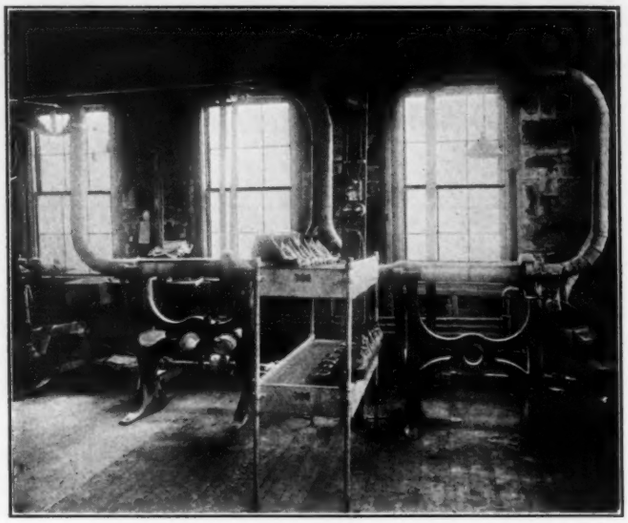
There are also a few other machines in this factory, as in every shoe factory, heated by gas. It is fair to assume that these machines, if electrified, would require at least 2.8 kw.-hr. per 100 pairs, making the total



ELECTRICALLY HEATED GOODYEAR STITCHING MACHINES

for industrial heating 20 kw.-hr. per 100 pairs. Assuming energy at 2 cents per kilowatt-hour, the cost for industrial heat per 100 pairs would be 40 cents.

In going over the energy figures given in the table, it is interesting to note how uniform the energy consumption has been, and how weather conditions affected the consumption of the bottom drier. July and August having been rainy and damp the consumption was higher than in September, when the weather was dry and clear, and the output was practically the same.



ELECTRICALLY HEATED BOTTOM DRIERS IN BROCKTON (MASS.) SHOE FACTORY

	July		August		September	
Shoes manufactured, pairs	14,821		16,998		16,468	
Total kilowatt-hours for heating machines	2,570		2,965		2,841	
Machines	Kilowatt-Hours	Kilowatt-Hours per 100 Pairs	Kilowatt-Hours	Kilowatt-Hours per 100 Pairs	Kilowatt-Hours	Kilowatt-Hours per 100 Pairs
2 Goodyear stitchers	312	2.1	369	2.1	341	2.1
2 Goodyear welters	217	1.5	232	1.4	240	1.4
2 Pulling-over machines	534	3.6	616	3.6	615	3.7
4 Box-toe steamers	620	4.2	724	4.2	707	4.3
1 Bottom drier	640	4.3	741	4.3	610	3.7
1 Bottom filler	171	1.2	211	1.2	179	1.1
1 Gem insole machine	76	0.5	72	0.4	149	0.9
		17.4		17.2		17.2

Advantages of Electric Heat in Shoe Industry

"Heretofore," said Mr. DeBard, "one of our greatest problems in interesting the shoe manufacturer in central station service for power, has been that of machine heating. But now that we are able to tell the manufacturer that electrically-heated machines can be substituted for the steam-heated machines, he becomes at once interested because

First—He is relieved of the trouble and large expense in operating a high pressure boiler, requiring a licensed operator, who in Massachusetts is not permitted to leave the boiler room for more than fifteen minutes at a time.

Second—He can apply heat to any one or more machines when and where needed.

Third—He has perfect control of heat.

Fourth—His costs are proportional to his output.

Fifth—His costs are less than by the high pressure steam method.

"In collecting data from a number of shoe manufacturers purchasing light and power from us, but operating high pressure boilers for industrial heating, we find that during the months of June, July and August, when no factory heating was required, the coal used runs between 90 and 191 lb. per 100 pairs of shoes made, the average being about 125 lb. per 100 pairs.

"As a concrete example, take a factory using 90 lb. per 100 pairs for industrial purposes, and analyze costs for one year:

Shoes manufactured one year	304,000 pairs	
Coal for industrial heating and factory heating, 307 tons	687,680 lb.	
Water evaporated	76,400 cubic feet	
Engineer at $24.00 per week		$1248.00
Coal, per ton		5.50
Water per 1000 cubic feet		1.00

COMPARATIVE HEATING COSTS

OPERATING COSTS—High pressure boiler and steam for industrial purposes.		
Coal, 307 tons at $5.50	$1,688.50	
Water, 76,400 cu. ft. at $1 per thousand	76.40	
Engineer, $24 per week	1,248.00	$3,012.90
OPERATING COSTS—Low-pressure boiler and electricity for industrial heating purposes.		
Coal, 185 tons at $5.50	$1,017.25	
Water, 46,000 cu. ft. at $1 per thousand	46.00	
Labor for heating thirty weeks at $10	300.00	
52,288 kw.-hr. at 2 cents per kilowatt-hour	1,045.76	2,409.01
Saving to shoe factory per year		$603.89
Per cent saving, 25.		

On a basis of 90 lb. per 100 pairs for industrial heat, 273,600 lb. of coal would be required, while 414,080 lb. or 185 tons remains for factory heating."

Measured Garage Service vs. Flat Rate

At the annual convention of the Illinois Garage Owners' Association held at Rockford, Ill., on Oct. 16 and 17, Gail Reed, general sales manager of the passenger car division Walker Vehicle Company, Chicago, read a paper on the subject of measured service in garages, which was also prepared with a view to making use of it in bulletin form for distribution by the Chicago Electric Vehicle Section of the N.E.L.A. In part it is as follows:

More stress is being laid on the matter of measured service versus flat rate to-day than heretofore because the rising costs in all branches of the business are necessitating a closer observation of details in order to realize a profit. The garage men are anxious to increase the narrowing margin between cost and income, and measured service basis of charge is the most legitimate means of increasing this income.

In an electric garage of average equipment containing fifty live customers, charging the customer a flat rate of $35 per month, which covers a wash every night, including polishing of trimming; cleaning of windows, upholstery, carpet; minor oiling and adjustments; deliveries to and from the customers' homes, and all the electricity the customer desires, the total income is $1,750. The corresponding income on fifty cars on measured service, based upon the average of rates used in the best measured rate garages, is obtained as follows:

Washing, allowing an average of three washes per week per car, which includes polishing of all trimmings, $1.25 per wash or an average a month per car of	$15.00
Storage, including the cleaning of windows and upholstery, curtains and carpets per month per car	12.50
Oiling and minor adjustments, alignments of wheels, flushing of batteries, which does not include packing of bearings or rear axle, per car per month	3.00
Amount of electricity based on 5000 miles per year at 6 cents per kilowatt-hour, average per month per car	9.00
Deliveries based on two per day, at 15 cents a delivery, average per month per car	7.00

Using the above notes as a basis, the following income per month on measured basis for fifty cars:

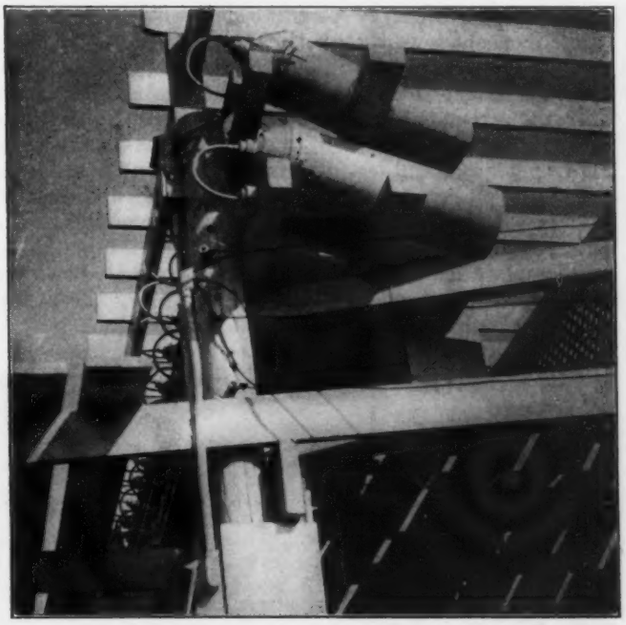
Washing average car	$15.00	$750.00
Storage	12.50	625.00
Oiling and minor adjustments	3.00	150.00
Current at 6 cents average per car	9.00	450.00
Deliveries, average per car	7.00	350.00
Total income	....	$2,325.00

Regarding the cost of installing meters, which would be necessary for measured service, it would appear that the increase in income possible under measured service would cover this item in so short a time that it would need very little consideration. The majority of central stations will rent the necessary meters at a very nominal sum, and apply the rent as principal against the cost of the meter. The author points out other advantages accruing from the use of measured rate service in addition to the increased income and consequent better profit. These include the elimination of many unnecessary washings and the elimination of unnecessary deliveries. Consequently less money will be spent by the garage in labor of car washers and car drivers, and these savings are representative of the cut in operating costs that can be made all the way down the line. For example, an electric garage will find its customers will order their cars charged only when necessary, instead of charging every night. This will save wear on rheostats and charging equipment. Furthermore, the customer will keep his car and batteries in better running condition by having renewals made promptly. If he does not, his battery will use two or three times the amount of current under normal conditions, and as he must pay for all he uses he will prefer to keep the battery in efficient condition.

Flood-lighting a Restricted Building Area with Hooded Projector Lamps

BY FRANK KIVEL

George Olinger, a Denver undertaker, has turned 56,600 cp. of flood-lighting on his grounds and mortuary. With its attractive pergolas, flowers and shrubbery, the building has long been one of Denver's show places by day. The comment occasioned aroused in Mr. Olinger's mind the idea that the façade of the building might be made attractive by night as well. He therefore sought the illuminating department of the Denver Gas & Electric Light Company and asked for suggestions. At the outset he stated, however, that the effect must not be garish or "circusy."



THE HOODED PROJECTORS ARE CONCEALED IN TRELLIS WORK WHICH IS SUPPORTED ON POLES BOXED TO MAKE THEM APPEAR SQUARE

Several schemes were tried before the present flood-lighting was finally accepted. The chief difficulty encountered was that of lighting the garden, pergolas and building simultaneously without objectionable shadows. As a first experiment projectors were placed on a building across the street, directly opposite the façade of the mortuary. This scheme failed, for while the lamps illuminated the building effectively, the glare was objectionable to persons coming from the building at night.

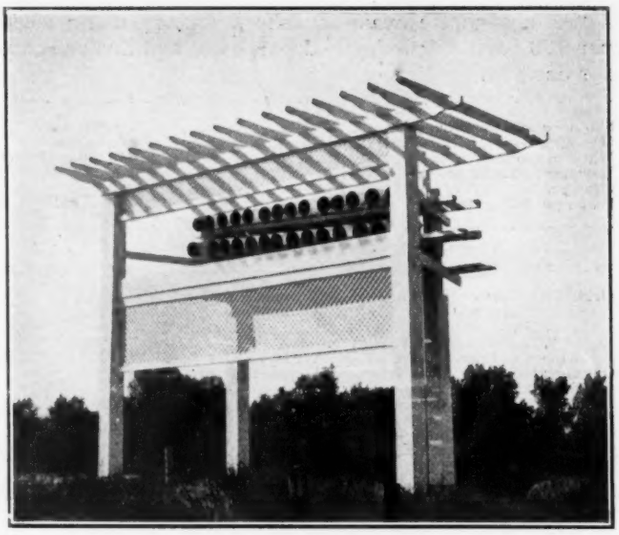
Lamps First Mounted on Basement Wall

Lamps to light the grounds and shrubbery were next installed in a well along the basement wall, but these made streaks of light across the lawn. To overcome this a rack was erected on a bluff 250 ft. from the building. Lamps on this rack were directed at such an angle that the façade and side of the building, and the lawn, shrubbery and pergolas, could all be illuminated from this one location.

As supports for this rack, four electric-light poles were set up; the two in front were placed 20 ft. apart, and 8 ft. back of these two more poles were set about 16 ft. apart. On a platform erected on these supports twenty-nine projectors were installed.

Tubular Hoods Added to Eliminate Stray Beams

Upon testing this installation it was discovered that, while it illuminated the grounds and building nicely, it also lighted an unsightly bluff, the street car tracks, and an apartment house two blocks away. Owing to the location of the rack on the face of the bluff it was impossible to build a satisfactory cut-off in front of it to control the distribution of light. To solve this light-control problem, tubes of galvanized iron, 32 in. long, were fitted over the reflectors. Even after this change had been made some stray rays of light still illuminated the rack and the bluff. To correct this trouble the interiors of the tubes were painted an optical black. To neutralize shadows from shrubbery, etc., groups of lamps were placed on the side of the building in three different locations and on the tops of electric light poles near the grounds. These units distribute light where it brings out the coloring of the flowers, makes the Lombardy poplars stand out against the sky-line and bathes the entire picture in a twilight glow. The illumination troubles were then considered entirely solved, but the rack remained something of an eyesore. To make the job complete the rack was made part of the ensemble by converting it into a pergola and painting the entire structure and the equipment with white enamel.



THE GRACEFUL TRELLIS STRUCTURE WHICH SUPPORTS THE PROJECTOR LAMPS

The electrical installation comprises in all thirty-five 110-volt, 250-watt flood-lighting projectors. The first cost of the installation was $800. The cost of operation is $100 per month.

Separate Control of Lamp Groups

Construction details have been worked out to make the installation convenient to operate. Each group of lamps is controlled by a separate switch. The tubes are fastened to the reflectors in such a manner that they may be easily removed when lamps need to be renewed. All wiring for each group of lamps is done in conduit to render the service absolutely reliable even during periods of bad weather.

While this installation is intended for use mainly when foliage is out, it will also be employed during or after heavy snowstorms in the winter season. It is expected that such snow effects will be beautiful. Mr. Olinger declares the flood-lighting system the best thing in the way of advertising he has ever undertaken. As a testimonial to its efficacy he has just purchased flood-lighting equipment to illuminate the fountains and grounds of his suburban home. Another and a most pertinent result of the installation is the decision of the city of Denver to install flood-lighting at the public library, at the Pioneer's Monument and at Cheeseman Park.

OLINGER'S MORTUARY, WHICH HAS BEEN ONE OF DENVER'S SHOW PLACES, IS NOW FLOOD-LIGHTED SO THAT IT PRESENTS AN EVEN MORE STRIKING APPEARANCE BY NIGHT

ADVANCE IN TECHNICAL THEORY AND PRACTICE

Including a Digest of Important Articles Appearing in the Scientific and Engineering Press of the World

GAS FUEL EXPERIMENTS IN BRITISH STATIONS

Progress of the Low-Temperature Carbonizing Process in Central Stations of Great Britain—Developments in Yorkshire and at Brighton

THE more efficient utilization of coal is one of the big operating problems that is constantly increasing in importance. Germany, forced by the necessities of the war, a year ago forbade the use of raw coal as fuel. Great Britain has also given this matter serious attention for years past, and in an unusually interesting editorial in the London *Electrician* of Oct. 6 it is said to be likely that in the final report of the fuel economy committee of the British Association the use of coal in its raw state as fuel will be condemned, "and that co-operation between electricity supply undertakings and carbonization works will play an important part in the developments and economies to be made. By its sponsors it is claimed that the adoption of the low-temperature carbonizing process enables a very high calorific value to be obtained from the coal in the form of 'coalite,' a smokeless fuel suitable for domestic use, while the gas may be used for the firing of boilers, and all the valuable distillates may be usefully employed in fostering important chemical industries at home."

Our London contemporary mentions some very interesting large-scale experiments made in British central stations. In connection with the development of the Yorkshire Electric Power Company's undertaking, which supplies an area of 1800 square miles, including the Yorkshire coal field, W. B. Woodhouse, after a careful study of the various processes of low-temperature carbonization, advised his company to enter into an agreement with a company, the Barnsley Smokeless Fuel Company (Ltd.), working the coalite process, to take all the surplus gas to burn under the boilers in place of coal. It is significant to note that the British government has taken a substantial financial interest in this large-scale experiment, and has entered into a contract for the purchase of the entire output of certain of the by-products. A long-term contract with a colliery insures a supply of suitable coal, and an agreement has been signed with a chemical company for the complete distillation of all the by-products.

A similar scheme for the supply of gas fuel to the Southwick electricity works of the Corporation of Brighton is under consideration at the present time, and extracts from the report of J. Christie, electrical engineer, on the proposed agreement are given in the same issue of the *Electrician*. We quote from the report as follows: "It is claimed that the adoption of the low-temperature carbonizing process enables the maximum heat value to be obtained from the coal in the shape of 'coalite,' a smokeless fuel excellently adapted for domestic use, while the gas and all the other valuable distillates in the shape of tar, sulphate of ammonia, benzol, toluol, and light and heavy oils are recovered for use in the manufacture of aniline dyes, fertilizers, rich motor spirit, high explosives, etc. . . . As a by-product to the process, there would be a large volume of surplus gas available, and it is proposed that the corporation should purchase this from the company at a low figure in comparison with the corresponding cost of coal, and by adapting a portion of their existing boiler plant at a comparatively small outlay, for firing by means of gas instead of coal, in this way utilize the waste heat contained in the gas for steam raising, and thus substantially reduce our fuel costs and minimize the labor, dirt and dust incidental to the present method of working entirely with coal."

Editorially the *Electrician* expresses the opinion that on the face of it the scheme seems a sound one, and so far as the corporation is concerned it stands to lose little by its adoption. "It appears that in the event of failure Brighton only stands to lose the cost of the pipes and fitting of burners in lieu of the present coal-fired grates, a matter of $6,000, and as an off-set against this the other party to the agreement will first have to spend upward of $250,000 on engineering works of a permanent character. If the experiment is successful the corporation should save at least $25,000 a year in the fuel bill. It is seldom that an investment of little more than $5,000 stands to yield such an amount.

"The figures given are of a striking character. A ton of coal contains some 27,000,000 heat units, and 90,000 cu. ft. of gas will have the same calorific value. Therefore, at the price quoted, the corporation will obtain for $2.81 the same quantity of heat as is contained in a ton of coal costing $5, and in a form in which the heat can be used to the best advantage. It is estimated that the surplus gas will produce at least 7,500,000 Board of Trade units per annum, and assuming that 110 cu. ft. of gas are required per kilowatt-hour, as against 3 lb. of coal, the cost for fuel, with coal at $5 per ton, will work out at 0.33 cent per unit for gas, as against 0.642 cent for coal, equivalent to a saving of 0.312 cent per unit. In addition to this, further saving due to reduced labor in trimming and ash removal, and to a reduction of radiation and stand-by losses will be effected. The possibility by obtaining a plentiful supply of fuel for domestic purposes at a reasonable cost is another side of the question which makes the scheme an attractive one. Prior to the war the price of good coal in Brighton was prohibitive, and was always on the up grade. In these days coal of inferior quality is selling at $10 to $11.25 per ton. If the claims made for 'coalite' are substantiated, the use of this fuel should go a long way toward promoting cleanliness."

The war has mobilized the inventive genius of engineers in various countries. These experiments in Great Britain certainly deserve watching.

Generators, Motors and Transformers

Commutating-Pole Machines with Brushes Off Neutral.—R. L. WITHAM.—One of the prime features of commutating-pole machines is that good commutation with a change in load may be obtained without shifting the brushes. The proper position for the brushes, or the neutral position, is determined for each machine by test before it leaves the factory, and the brushes are set in this position and so secured as to maintain the

proper brush-setting permanently. If for any reason this setting should be disturbed, there are three important effects which would result from such a shifting of the brushes. These are: (1) A change in voltage in the case of a generator and a change in speed in the case of a motor. (2) Poor commutation. (3) Increased heating. The extent to which these effects become evident depends upon the amount of brush shift and the design characteristics of the machine. These three effects are discussed in succession. With respect to the effect on the voltage of the generator it is shown that advancing the brushes in the direction of rotation reduces the emf., while moving the brushes backward increases the emf. In an analogous way advancing the brushes in the direction of rotation for a motor decreases the speed, while shifting the brushes backward increases the speed. This effect is shown quantitatively in Fig. 1 for a 20-hp., 230-volt, 650-r.p.m. commutating-

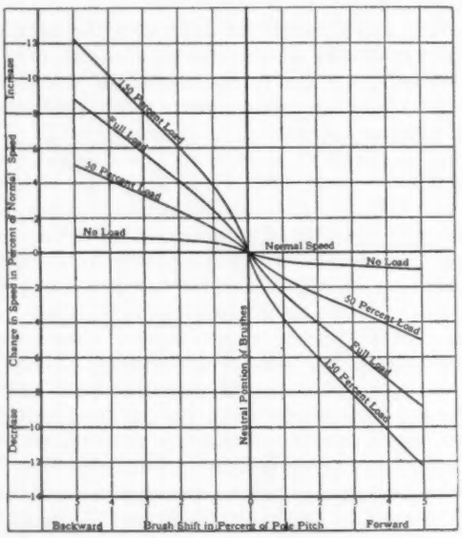


FIG. 1—EFFECT OF BRUSH POSITION ON SPEED

pole motor with various loads. The brushes were shifted as far as possible in each direction, their range of motion being limited by the size of the slot in the bracket which supports the bearing and brush-holder. In the extreme positions the brushes were distant from the neutral about 5 per cent of the pole pitch. This position of the brushes gave a full-load speed approximately 9 per cent higher or lower (according to whether the brushes were shifted backward or forward) than the full-load speed with the brushes at neutral. As the curves in Fig. 1 indicate, the greater the load the greater the change in speed, since the commutating-field strength increases with an increase of load.—*Elec. Jour.*, November, 1916.

Generation, Transmission and Distribution

Electricity in Mines.—W. D. Bourlier.—An illustrated article on the electrification of the Bethlehem-Chile iron mines at Cruz-Grande in Chile. The electrification covers the apparatus and equipment for mining, crushing and transporting the ore to the coast for shipment. The power-house equipment, selected to provide for the mining and transportation of 5000 tons of ore a day with necessary provision for additional machines to ultimately handle 10,000 tons of ore a day, is as follows:

	Present	Future Additions
440-hp. oil-fired boilers	4	2
3500-kw. turbines	2	1
300-kw. turbines	1	1
1000-kw. railway motor-generator sets	2	1
2000-kw. bank step-up transformers	2	1
Evaporator equipment	1	0

The steam pressure adopted was 200 lb., 100 deg. superheat at rating. The boilers are good for 100 per cent overrating continuously. The main generating voltage is 2300, three phase, 60 cycle. The railway motor-generator sets, which are 2400-volt, direct-current units, are fed directly from the main 2300-volt buses. Power to the mine is supplied through step-up transformers at 22,000 volts, over duplicate transmission lines. The auxiliary power for the station and surrounding locality is generated at 600 volts, 60 cycle, three phase.—*Gen. Elec. Review*, November, 1916.

Powdered Coal.—C. J. Gadd.—An illustrated paper discussing the engineering principles involved in the use of powdered coal as fuel with reference to metallurgical applications.—*Journ. Franklin Inst.*, September, 1916.

Traction

British Municipal Tramways Association Meeting.—An account of the fifteenth annual conference of the (British) Municipal Tramways Association at London. The president, Peter Fisher, discussed the relation of British tramways to the war. The most outstanding features of the year are the readjustment of tramway fares and stages, the employment of females, and the introduction of volunteer labor for driving. During the year proposals for increasing fares, shortening stages, or abandoning one cent fares have been considered by various tramway authorities. In several cases changes have been made whereby the average fare has been materially increased, and in all these cases additional revenue has been the result. It is remarkable that, in the main, tramway fares have not increased very seriously. Tramway traveling is about the only commodity that has not been generally increased in Great Britain. Having regard to the increased working costs consequent on higher wages and bonuses, war allowances, and the increased cost of tramway supplies, it is not surprising that the question of increasing revenue should demand the attention of those operating many tramway systems. There are now 8609 females employed on British tramways; 8433 as conductors, and 176 as drivers, and they have earned the approbation of the tramway authorities and tramway patrons. Freight transportation by tramways was suggested as one of the problems of the future. The following papers presented at this conference are also printed. Some notes on passenger transportation in large cities by J. M. McElroy, and utilization of tramways for freight traffic, by C. W. Holford and W. Clough.—London *Electrician*, September 29, 1916.

Electrophysics and Magnetism

Direct-Current Corona from Different Surfaces and Metals.—Sylvan J. Crooker.—It has been shown by F. W. Peek and by S. P. Farwell that the corona discharge is quite different when the wire is positive and when it is negative. The starting point of the corona as well as the characteristic curves depend on the polarity of the wire. When the wire is negative the corona assumes the form of bright "beads," which are strung along the wire more or less evenly, the number of the beads per unit length depending on the pressure of the gas and the potential difference between the wire and the cylinder. This beautiful but complicated phenomenon suggested that probably the surface conditions and the chemical nature of the wire might influence at least the negative corona in the form of beads. The object of the present author's experiments was to find out the influence of the surface condition of the wire upon the starting point and the characteristics of the corona discharge phenomena. The chief results are as follows: The surface condition as well as the metal

itself has an effect on the starting voltage and on the characteristic curves. The number and brightness of the negative beads depend in a very complicated way on the surface conditions. A thin layer of insulation on the wire renders the escape of negative electricity easier; this paradox is explained. The formation of beads and their instability is explained on the assumption that the current is due to an emission of electrons from the surface of the metals and due to ionization by collision. Most of the complicated phenomena are explained by this assumption.—*Phys. Review,* October, 1916.

Normal Photoelectric Effect of Lithium, Sodium and Potassium as a Function of Wave-Length and Incident Energy.—WILMER H. SOUDER.—An account of an investigation, the chief results of which are as follows: The mercury arc is the only source found free from stray effects when used with the Hilger monochromatic illuminator. This statement applies to the more intense lines only, where, if stray effects be present, they are negligibly small. New surfaces of lithium, sodium and potassium are found to be photo-active. A maximum suggesting the selective effect for sodium and potassium has appeared under conditions which are supposed to yield only the normal effect.—*Phys. Review,* September, 1916.

Units, Measurements and Instruments

Compensated Dynamometer Wattmeter Method of Measuring Dielectric Energy Loss.—G. B. SHANKLIN.—An article describing a recently developed method of measuring dielectric energy loss, that has given very satisfactory results both in accuracy and ease of operation. Fig. 2 is a circuit diagram of the ordinary dynamometer wattmeter method of measuring small losses. The deflection of the instrument depends upon the values and phase relation of the currents I_{cc} through the current coil *cc* and I_{vc} through the voltage coil *vc*. There is a possibility of considerable error due to the phase relations. A method of controlling the current I_{cc}, so that it may be kept exactly in phase with the voltage E_p under all conditions of load and voltage, eliminates the errors of the ordinary method. This control forms the principle of the compensated dyna-

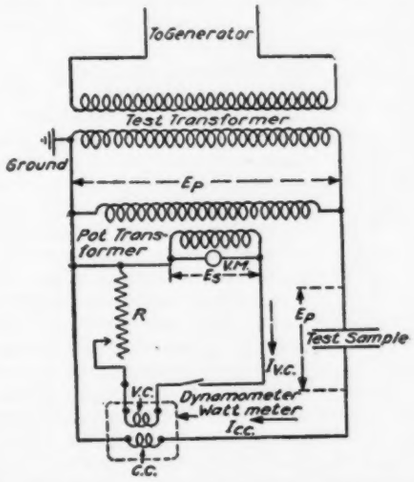


FIG. 2—ORDINARY DYNAMOMETER WATTMETER METHOD

mometer wattmeter method. As shown in Fig. 3, this method derives its name from the small fixed capacity *c* (1 microfarad) and the small variable resistance *r* (zero to 200 ohms), which are inserted in the voltage-coil circuit. Placing *c* and *r* in parallel and varying *r* results in the effect of a variable capacity. With this compensator it is possible to neutralize the inductance of the voltage coil circuit and to swing current I'_{vc} exactly into phase with voltage E_p. But to do this some standard of reference is necessary. A zero loss condenser having approximately the same capacity as the test sample is the most satisfactory standard of reference. The current I_{cc} then leads the voltage E_p by 90 deg., and it is a simple matter to bring current I'_{vc} into

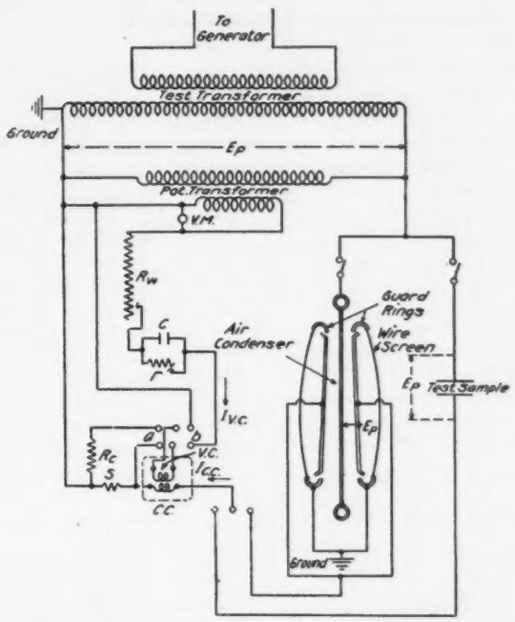


FIG. 3—COMPENSATED DYNAMOMETER WATTMETER METHOD

phase with E_p by varying *r* until the deflection of dynamometer beam is zero. The condenser can then be replaced by the test sample and the true watts loss measured.

No further corrections are required or necessary excepting, of course, the calibration constants of the instruments and transformation ratio. It is apparent that the accuracy of the whole test depends upon the standard condenser having a negligible loss over the range of test voltage, zero to 60,000. The greatest difficulty encountered was the design and construction of a condenser for these requirements. The construction of the zero-loss air-condenser is described in great detail with a thorough discussion of the possibilities of error, and the results are given of energy loss measurements on several types of insulation.—*Gen. Elec. Review,* October, 1916.

Telegraphy, Telephony and Signals

British Automatic Telephone Exchange.—A long and fully illustrated description in great detail of the equipment of the new automatic exchange at Grimsby.—*British Post-Office Elec. Eng. Jour.,* July, 1916.

Audion as a Valve and as an Amplifier.—In the article on page 727 of the Digest for Oct. 7, 1916, reference is made to Figs. 5 and 6 as audion circuits invented by Dr. DeForest. This statement should apply only to Fig. 5 as described, Fig. 6 representing a later development and not an original DeForest arrangement.—EDITOR.

Miscellaneous

Wages in Manufacture.—F. BAYLE.—A general discussion of various modern theories of wages in manufacture using mathematical symbols for characterizing the different systems.—Translated in abstract from an article appearing in the *Journal* of the International Society of Electricians in Paris, in London *Electrician,* Oct. 6, 1916.

P. M. Golden has resigned as manager of the Middletown division of the Connecticut Power Company.

A. M. Larson, general superintendent of the Shaw Electric Crane Company of Muskegon, Mich., has been appointed works manager for the company.

W. R. Phipps, general manager of the Brush Electric Company, Galveston, Tex., has been elected a director of the Galveston Commercial Association.

J. B. Anderson, former assistant manager of the Baton Rouge (La.) Electric Company, has moved to Brockton, Mass., to enter the employ of the local gas company.

Arthur Park of Cohocton, N. Y., has been appointed local superintendent of the Wayne Power Company, succeeding Gordon Cooley, who was recently transferred to Sodus.

George N. Rooker, manager of the Sandpoint (Idaho) division of Northern Idaho & Montana Power Company, has been elected secretary and treasurer of the Sandpoint Commercial Club.

Gordon Cooley, who has been superintendent of the Cohocton, N. Y., system of the Wayne Power Company of Sodus, N. Y., has been transferred to the company's headquarters at Sodus.

Robert Montgomery, manager of the commercial department of the Louisville Gas & Electric Company, Louisville, Ky., served as chairman of the Louisville Advertisers' Club committee having charge of arrangements for Advertisers' Week, Oct. 2 to 6.

B. C. Adams, who has been manager of the Montgomery (Ala.) Light & Water Power Company, has been appointed manager of the Empire District Electric Company at Joplin, Mo., which serves a large lead and mining load in the southwestern Missouri and eastern Kansas mining fields.

H. F. Jackson, vice-president and general manager of the Sierra and San Francisco Power Company of San Francisco, was elected president of that company at the recent annual meeting. Other officers named were J. W. Moffitt and P. M. Hoskins, vice-presidents, and F. J. Blanchard, secretary-treasurer.

C. W. Kellogg has been appointed district manager for the Stone & Webster Company, at Keokuk, Iowa, having supervision of the following companies: Houghton County Electric Light Company, Dallas City Light Company, Fort Madison Electric Company, Keokuk Electric Company, Paducah Light & Power Company and the Mississippi River Power Company.

E. A. Wilcox, who was at one time operating superintendent and later commercial agent for the Great Shoshone & Twin Falls Power Company at Twin Falls, Idaho, and who until recently was electric heating specialist for the Great Western Power Company at San Francisco, has been appointed manager of the Public Service Company of Oklahoma at Tulsa, Okla. Mr. Wilcox is the author of a recent book on electric heating.

Men of the Industry

Changes in Personnel and Position—Biographical Notes

Francis P. Thrasher has been appointed superintendent of the Buzzards Bay Electric Company's plant at Chatham, Mass. Mr. Thrasher's district will include the territory east of South Yarmouth to Chatham.

William A. Durgin, chairman of the lighting committee of the Commonwealth Edison Company, Chicago, whose lectures on lighting have been features of several recent conventions, was graduated from the course in electrical engineering of the Massachusetts Institute of Technology, class of 1902. Immediately upon leaving college he joined the Stone & Webster organization. Until December, 1904, he remained with this firm, finally becoming assistant lighting superintendent at the company's Terre Haute (Ind.) property. He later took a position in the testing department of the Commonwealth Edison Company and in 1909 was made assistant chief testing engineer for that company. In June, 1916, when the Commonwealth company's lighting committee was organized by Vice-President Ferguson to promote economic advance through the increased consumption of raw light, Mr. Durgin was appointed to his present position, that of chairman of the lighting committee. Mr. Durgin has contributed a number of technical papers to the literature of the industry. Two recent lectures, "Lighting—By-Product, or Buy Product," presented before the N. E. L. A. at Chicago last June, and "Controlled Light and the Satisfactions of Life," delivered during the I. E. S. lecture course at Philadelphia in September, have attracted particular attention. He is also the author of a book on "Electricity, Its History and Development."

W. A. DURGIN

A. T. Ruttencutter has been appointed general superintendent of the Ohio Service Company at Coshocton, Ohio. During the past year Mr. Ruttencutter has been connected with the sales department of the Westinghouse company, and prior to that he was for eight years at Rio de Janeiro, Brazil, with the Pearson interests.

Obituary

R. E. Noyes, for seven years an instructor in electrical engineering at Pratt Institute, Brooklyn, N. Y., who moved with his family to Pittsfield, Mass., last June to escape the infantile paralysis epidemic, was stricken with the disease on Oct. 16 and died two days later from acute anterior poliomyelitis at his home in Pittsfield.

Charles Wilcox Hotchkiss, president and director of the Richmond Light & Railroad Company of Staten Island, N. Y., died at Battle Creek, Mich., on Oct. 28. Mr. Hotchkiss was born in Unadilla Forks, N. Y., in 1862. At the time of his death he was also president and a director of the Chicago (Ill.) Utilities Company and chairman of the board of directors of the Virginian Railway Company.

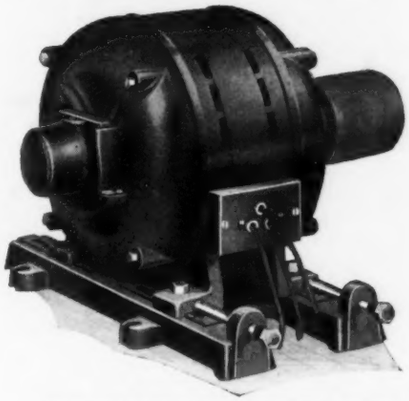
Arthur C. Eastwood, president of the Electric Controller & Manufacturing Company of Cleveland, Ohio, died on Oct. 17 at Battle Creek, Mich. Mr. Eastwood was widely known as an electrical engineer and inventor. He received his technical education at Rose Polytechnic Institute, and shortly after graduation entered the Homestead Steel Works, and was associated with A. C. Dinkey in the first extensive application of electrical power in the manufacture of steel. He left Homestead to become electrical engineer for the Tennessee Coal, Iron & Railway Company and while at the Ensley mills his work attracted the attention of S. T. Wellman, and he was persuaded by Mr. Wellman to come to Cleveland to accept the positions of electrical engineer for the Wellman-Seaver Engineering Company and chief engineer for the newly formed Electric Controller & Supply Company. As a result of Mr. Eastwood's inventive ability, the growth of the latter company was so rapid that he was soon forced to give the business his entire attention, under the title of general manager and chief engineer. About 1905 the firm was reorganized and its name changed to the Electric Controller & Manufacturing Company, with Mr. Eastwood as active head of both the financial and engineering phases of the business. Mr. Eastwood was the patentee of nearly 100 inventions, covering various phases of electrical control and power generation. His greatest pride, however, was in the lifting magnet, to the development of which he gave his personal efforts. Mr. Eastwood was a member of the Union and Mayfield Country Clubs of Cleveland, and of the Engineers' Club of New York, and was a Fellow of the American Institute of Electrical Engineers.

NEW APPARATUS AND APPLIANCES

A Record of Latest Developments and Improvements in Manufacturers' Products Used in the Electrical Field

Polyphase Motors with Rotor-Centering Bearings

Howell induction motors have been designed with unusually large bearings, which, it is claimed, give a greater factor of safety against ordinary wear.



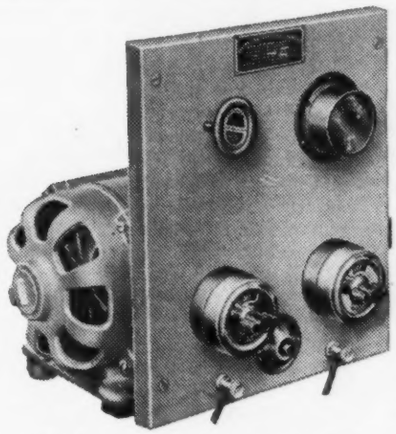
POLYPHASE MOTOR EQUIPPED WITH ROTOR-CENTERING BEARINGS

The bearing bushings, made of high-grade phosphor bronze, are of a two-piece rotor-centering oil-ring type. This gives a large oil reservoir around the circumference of the shaft in the center of the bearings, so that a certain portion of the shaft rotates completely in oil. This oil is carried from the center along the bearing surfaces by means of spiral grooves cut in the face of each bushing. The maker points out that with belted types of motors the greatest pressure is on one side, so that when the bearing wears away on this side the clearance, or air gap, between the stator and the rotor is disturbed. When this bearing is used, it is claimed that the outer bushing may be rotated half way around, thereby bringing the unworn portion of the bushing under the shaft where the pressure and wear come and thus recenter the rotor and provide the original air-gap clearance on all sides. The inner, or guide, bushing is not turned, thereby giving a full fit to the top of the shaft and eliminating a chance for play in the bearing. The outer bushings are held in place in the bearing housing by means of a set screw at the side of the housing, and it is only necessary to loosen this set screw in order to rotate the bushing. The rotor, it is stated, may be quickly recentered by an unskilled workman, as it is not necessary to remove the end plates or in any other way disturb the motor.

These motors are built in sizes from 0.5 to 75 hp. and are furnished for operation on 110, 220, 440 and 550 volts, two-phase and three-phase circuits of all commercial frequencies and standard speeds. The 7.5 hp. and larger motors are regularly supplied with manually operated starting compensators, complete with no-voltage release, fuse blocks and oil for tanks. The smaller sizes do not require starting compensators. These motors are made by the Howell Electric Motor Company, Howell, Mich.

Small Battery Charger

The small battery charger shown here, consisting of a motor, generator, panel and instruments, is being manufactured by the Ellington Electric Company of Quincy, Ill. The motor is of the squirrel-cage type with cooling vanes and vents to force cool air over the windings, and the heated air out through the passages provided. The bars and end rings of the squirrel cage are cast integral, insuring maximum strength and rigidity. The generator is a four-pole design with liberal commutator and armature windings, so that in the event of the apparatus being connected with only a few cells and the rheostat adjustment forgotten, the generator will not be damaged as it can withstand this overload, it is claimed. The panel is of slate, attached to braces from the apparatus. It is equipped with alternating and direct current switches, ammeter and field rheostat. The ammeter is of permanent magnet, moving coil construction with uniform scale divisions and dead beat. This set is suitable for charging batteries requiring a 15-amp. rate or less.



BATTERY-CHARGING SET FOR RATE OF 15 AMP. OR LESS

Electric Household Coffee Mill

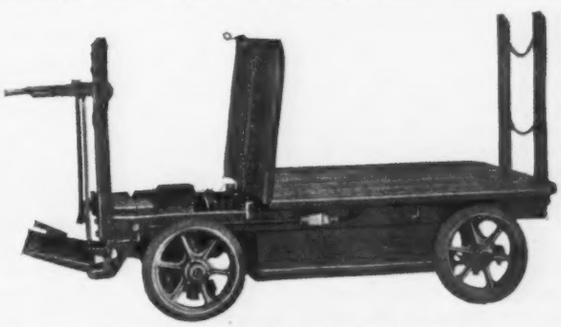
An electrically-operated coffee mill is now manufactured for home use by the Hamilton-Beach Manufacturing Company of Racine, Wis. The motor is rated at 1/12 hp. and operates on either a.c. or d.c. circuits. The mill can be adjusted to grind either fine or coarse, and is equipped with two sets of knives for this purpose. All parts are readily accessible so that the mill can be taken apart very easily for cleaning purposes. It is completely nickeled and has a very handsome appearance.

Electric Industrial Truck

Samuel L. Moore & Sons Corporation of Elizabeth, N. J., has developed the electric truck shown in the accompanying illustration for use in manufacturing plants, warehouses, railroad terminals or wherever material is to be moved or shifted in quantities. The truck is designed for severe working conditions and will run, it is claimed, at a speed of 5 to 7 miles per hour with a full load of 4000 lb. for a working day of ten hours on one charge.

The frame is made up of 4-in. channel steel braced with large gusset plates and riveted cross members. The platform is 23 in. above the floor and is constructed of 1.5-in. oak planking, reinforced on the edges and corners with angle steel. Metal strips protect the flooring and save the platform from undue wear. The truck is driven through a worm differential, giving positive traction, with the worm and worm wheel mounted on ball bearings. The worm wheel is inclosed in a housing and continually runs in oil, thoroughly protected from dust and dirt. The wheels are of cast steel mounted on tapered roller bearings. The tires are of solid rubber 20 in. in diameter with a 3.5-in. face.

The motor is especially designed for vehicle and storage-battery use. It is

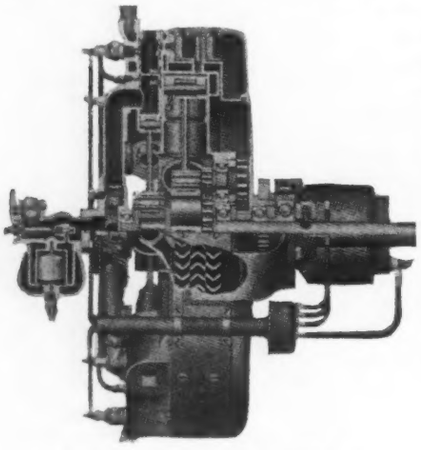


INDUSTRIAL TRUCK, SHOWING MOTOR AND CONTROLLER MOUNTING

operated on 36 volts, and takes 35 amp. at 1000 r.p.m. It will safely stand 120 amp, 36 volts, it is said, for ten minutes without serious heating. The type of battery usually furnished consists either of the Ironclad exide lead type or of the Edison iron and nickel type. The drum-type controller has three speeds forward and three reverse with a positive stop between.

Gas Turbine

The intake of new gas, the compression, ignition and utilization of the exploding gases to their greatest efficiency, proper lubrication and the application of power to the driving shafts are points which it is claimed have been solved in the gas turbine now made by the Detroit Gas Turbine Corporation, Detroit, Mich. The exhaust gas is taken care of in such a way that no muffler is required. The absence of such muffler baffle causes every atom of energy to be delivered to the driving shaft, while the exhaust emerges from the chamber at little more than atmospheric pressure. The rotor is made up of the outer casing and to this are attached the moving blades with the stationary blades between. The moving and stationary blades or members are 1-16 in. apart, which, it is claimed, eliminates friction and the necessity for lubrication. The only lubricant necessary is applied to the compressor pistons and the follower valves, with their attachments. Since all parts are of small proportions and no fire comes in contact with the rubbing surfaces the amount of oil required is inconsiderable. Compressor cylinders and follower valves are entirely surrounded by suitable water jackets designed in ample proportions.



CONSTRUCTION OF AN IMPULSE GAS TURBINE

The effective rotor diameter of a 200-hp. turbine would be 21 in. and geared to the main driving shaft at a reduction of 3:1. At a driving shaft speed of 3000 r.p.m. the rotor would turn at 9000 r.p.m., which is equivalent to 24,000 explosions per minute. The gas compressed from these explosions is directed through the nozzles at a most effective angle and at a high initial pressure.

Liquid Rheostatic Control for Large Alternating-Current Wound-Rotor Motors

For use with motor-driven mine hoists, dredges and similar applications, the Westinghouse Electric & Manufacturing Company of East Pittsburgh, Pa., has designed the liquid type of control shown in Fig. 1. With large wound-rotor induction motors it is claimed that this outfit will give wide and accurate speed variation, positive time-limit acceleration, and allow the motor to run at reduced speeds for long periods.

The liquid controller consists essentially of a primary panel and a liquid rheostat. The primary panel is made up of mechanically interlocked magnetic contactors for starting, stopping and reversing the motor, oil circuit breakers which entirely disconnect the motor from the line in event of an overload, a fused knife switch for pump motor, and a low-voltage relay for the protection of operator and apparatus against voltage failure. The secondary control consists of a liquid rheostat complete with brass or wrought-iron cooling coils for varying the resistance in the motor secondary, a pump and pump motor switch for the circulation of the electrolyte, and a master switch for the control of the equipment. For plugging service a single lever "H" slot device and two overload relays are used. The two overload relays are mounted on the primary wheel and protect the motor from overloads when running, but are short-circuited when plugging the motor. When operating under these conditions the circuit breaker is set to protect the motor against exceptional overloads and short-circuits on the motor, but too high to trip out in ordinary plugging service.

In the type of control shown the depth of the liquid, in which the electrodes are immersed, is varied. This principle insures smooth acceleration and close speed regulation of the motor, as an infinite number of steps can be obtained by gradually varying the depth of the liquid. As shown by the diagram, the three secondary phases of the motor are each connected to a set of electrodes suspended in the electrode tank. The operating lever is attached to an arm just above the master switch. When the lever is in the "off" position, the electrolyte, which is a solution of sodium carbonate (sal soda) is at its lowest level. When the operating lever is moved from the "off" position the contactors in the primary circuit are

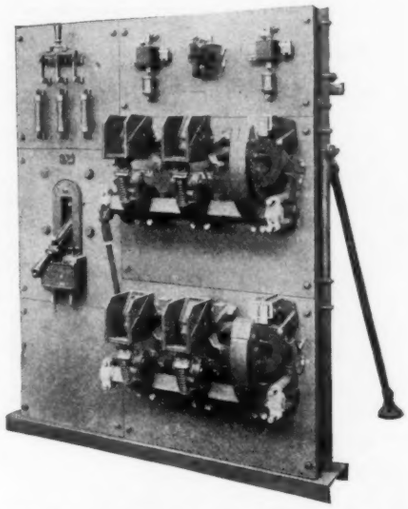


FIG. 2—CONTROL BOARD USED FOR LARGE ALTERNATING-CURRENT WOUND-ROTOR MOTORS

operated by the master switch and the weir raised. The electrolyte, which is circulated continuously by the pump, rises as the weir is raised. This immerses the electrodes more, decreases the resistance in the rotor circuit, and speeds up the motor. By adjusting the position of the weir the resistance in the rotor circuit is changed and the speed of the motor regulated. A regulating valve in the pump discharge or intake pipe prevents the liquid from rising in the electrode tank at a rate greater than that for which the valve is adjusted. So the lever may be moved directly to the "full on" position while the liquid will raise at the rate determined by the valve setting. The weir, however, is of such a size and design that the electrolyte will flow through to the lower compartment speedily enough to take care of plugging when that is practised.

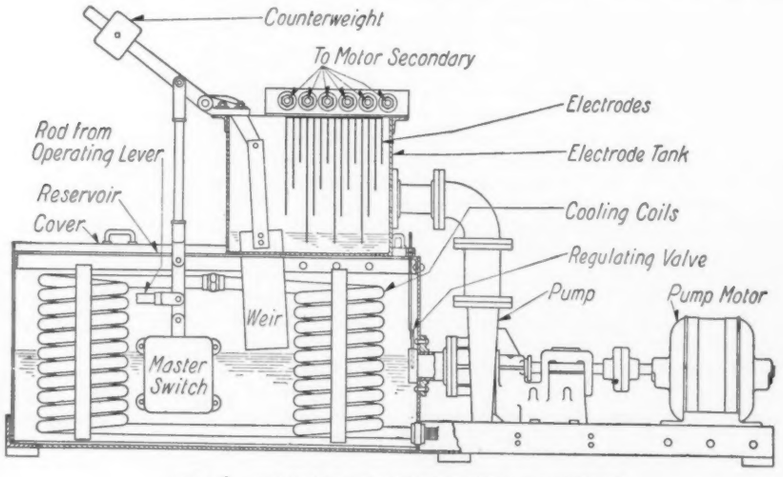


FIG. 1—DIAGRAM OF LIQUID TYPE OF CONTROL

For this plugging service the single lever "H" slot device and the two overload relays afford a positive protection against the wrong operation of the lever. To prevent over-travel in hoist work either single or double pole hatchway limit switches can be furnished. When the hoists are used for lowering an overspeed device is desirable.

Cam limit switches form another good means of protection, safeguarding against accidents due to carelessness on the part of the operator. These consist of a number of switches operated by means of cams mounted on a hexagonal shaft connected to the driving motor or the driven mechanism through a chain and sprocket, or through a worm gear.

Traffic Post

George Cutter Company of South Bend., Ind., has designed a traffic post to match its Park View single-unit post made for use in residence districts. In the accompanying illustration this post is shown installed at a street crossing on St. Louis Boulevard in South Bend.

The design of this post is similar to the one described in the July 8, 1916, issue of the ELECTRICAL WORLD. It is made of cast iron, artistically proportioned, and may be equipped with either ruby or white diffusing globes and porcelain enameled signs bearing the words "Keep to Right." These posts are fitted with medium or mogul screw multiple sockets or series film sockets of the "Regent" and "Standard" types. In the Standard designs of these traffic posts the base is 14 in. in diameter, 24 in. high, with the column 5 in. in diameter above the base, tapering to 3.5 in. in diameter near the top. The height from the base plate to the bottom of the globe is 6 ft.

A concrete foundation is recommended for these posts and provisions are made for attachment to three bolts set in this foundation. Connections are usually made with a cable placed

INSTALLATION OF A SILENT WATCHMAN TRAFFIC POST IN RESIDENTIAL DISTRICT

underground. For overhead circuits a crossarm is furnished to clamp directly beneath the globe holder, which makes use of porcelain bushings at the point where the wires enter.

Horizontal-Retort Underfeed Stoker with Novel Features

While the general principle of using horizontal-top retorts fed by horizontal rams, as is done in the new Molloch underfeed stoker, represents no innovation, this make of stoker embodies some details of construction which are rather ingenious. Among them are the use of rotary grinders parallel to each retort for disposing of the ashes and stirring up the fire; arrangements for minimizing the strains in parts subjected to ex-

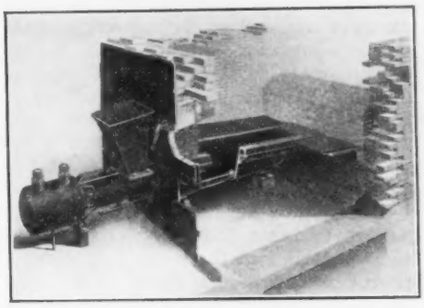


FIG. 1—CYLINDER OPERATING FUEL RAM AND INTERIOR OF FURNACE

cessive mechanical stresses and intense temperatures, and provisions for economically controlling the fuel feed.

As shown by the accompanying sectional views, the stoker is made up of units, each consisting of a horizontal-top, V-shaped retort, along the upper edges of which are mounted tuyere blocks, through which air is supplied under pressure. Fuel is fed into the retort by a steam-operated ram, which is supplied with coal from a hopper attached to the ram case outside the furnace. Between each retort and along each side wall, where the products of combustion are deposited, are rotary grinders which are operated intermittently in the same manner as the fuel-feeding mechanism. The frequency of operation, as well as the relative amounts of rotation of each grinder, can be varied as conditions require. By removing the ash throughout the entire furnace a simple ash hopper can be employed, a basement or deep ash tunnel usually being unnecessary.

Two methods of stoker control may be employed: One is to actuate the steam-cylinder valves by steam and the other is to control them by solenoids. In either case the master control is attached either directly or indirectly to the fan prime-mover, so that fuel is fed into the furnace at a rate proportional to the air supply. When steam control of the fuel feed is employed the fan mechanism operates a pilot valve controlling the steam inlet and exhaust parts. With electrical operation the fan actuates a contactor, which in turn performs the previous-mentioned operations by means of solenoids. The master control shuts off the steam supplied to the ram cylinders after a certain portion of the piston stroke is completed, so economical steam consumption is assured. Main steam and exhaust headers are placed in a trench beneath the stoker cylinders to amplify piping and reduce radiation therefrom.

On account of the intense heat and severe expansion and contraction stresses to which the retort walls are subjected, they are made in sections, thus eliminating the necessity of replacing large parts when defects occur. The lower section of the retort is divided into a large front and rear section, and the upper part into sections 20 in. long. All parts are closely fitted and the sections firmly bolted together and well ribbed to prevent cracking. The joints are made with asbestos furnace cement. Any section which becomes cracked will remain in position for service, and can be replaced without disturbing any other section.

The retorts are supported on each side throughout their entire length to allow for expansion without injury. The air boxes which are made of cast-iron plates are attached to and hung from the retort supports, and are built in sections with removable bottoms.

The tuyere blocks consist of heavy castings which are locked in place, the surface which is in contact with the fire being provided with fins on the under side. These serve the double purpose of absorbing heat from the fire and dissipating it to the incoming air. The tuyere blocks are made in sections 10 in. long and the dead plates divided into sections 20 in. long. The lower edges of the stokers are attached to an angle iron which extends across the entire furnace, thus preventing the stoker movement from bulging the boiler front, and allowing for expansion and contraction. The fire doors are equipped with cast-in-place firebrick linings, to avoid the trouble sometimes caused by brick becoming loose and falling out.

The one-ended cylinders with steam ports cast in the walls are employed to permit the use of short and simple steam connections. By removing cap screws fastening the cylinder to the ram case the entire coal-feeding portion of the stoker may be dismantled. Upon the cylinder being removed, the piston, stuffing box, gland, piston rod and ram can be withdrawn and the stoker exposed for inspection or renewals. All valve bodies are interchangeable.

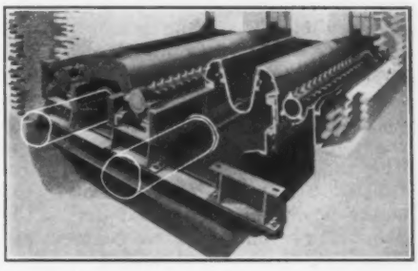


FIG. 2—CUT SECTION OF RETORT AND ASH REMOVER

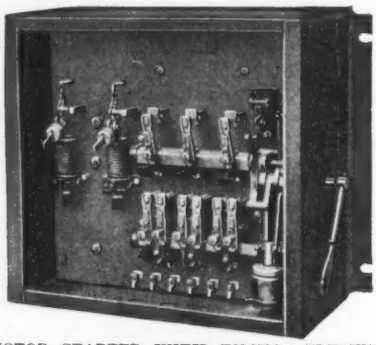
For small installations the Molloch stoker is made in the manually cleaned type. With this or the self-cleaning type, as many stokers can be combined under one boiler as the space and conditions require. Their installation is not confined to new boiler equipment, as no special brick work or fire arches are required. Where a basement exists for the storage of refuse or ash,

the design can be readily altered to receive stokers. Where a basement or ash tunnel does not exist, a pit directly under the boiler furnace can usually be arranged. On account of the fuel bed being horizontal the boiler does not have to be set as high as with an inclined fuel bed. Where possible, however, a relatively high setting is recommended by the manufacturer.

This stoker is manufactured by the Molloch Stoker Company, Chicago.

Motor Starter with Automatic Timing Device

To operate the motor starter shown in the accompanying illustration the motor circuit is closed by throwing the lever up when the subsequent acceleration is automatic. The time can be adjusted as desired, it is pointed out by the maker, thereby eliminating the judgment of the operator in cutting out the resistance of the motor circuit. This controller consists essentially of two square shafts; the upper one carrying the main contacts and provided with a handle, the lower one carrying six fingers arranged in such a manner that they make contact with the stationary contacts in rotation; that is, one closes after the other, the time of closure being determined by a dashpot which prevents improper starting.



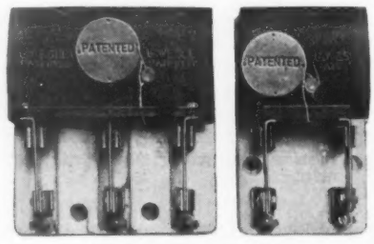
MOTOR STARTER WITH TIMING ELEMENT TO PREVENT IMPROPER STARTING AND LINE SURGES

For the control of squirrel-cage motors, resistance is inserted in the primary circuit of the motor. After the closure of the main contacts on the upper shaft, the resistance which is in circuit and in series with these main contacts is gradually cut out by the drum fingers on the lower shaft, and when all the fingers are closed the resistance is short-circuited and the motor is directly connected across the line. As soon as the main contacts are closed the no-voltage release is energized, and it then holds the main shaft in the closed circuit position. In case of failure of voltage this no-voltage release disengages the upper shaft and this opens the motor circuit completely. If desired, a push button may be installed in this no-voltage release circuit so that the motor may be stopped from any convenient point, or overloads may be connected in this circuit to open it and to automatically protect the motor against excessive load. The motor may also be stopped by pushing the operating handle to the extreme lower position, in which it engages the upper shaft and pulls it away from the no-voltage release, thereby opening the main contacts.

In the "off" position the lower contacts are all closed and therefore the starting resistance is short-circuited, but these contacts are open before the upper contacts are closed so that the motor is always started with all the resistance in circuit. On the other hand, this arrangement allows the main motor circuit to be opened without first reinserting the starting resistance into this circuit, an arrangement which is common on other types of manual starters and which is to some extent objectionable as it causes some sparking on the contacts while the resistance is inserted. In case of slip-ring type motors, the lower contacts control resistance in the secondary circuit of the motor while the upper contacts close the primary circuit. With slip-ring motors the fact that the resistance is not reinserted in the secondary circuit of the motor before opening the primary circuit is particularly valuable, as the sparking due to the opening of the primary circuit is greater the higher the resistance that is inserted in the secondary circuit. The current-breaking capacity of the apparatus is large and the spacing of the primary contacts and their opening is such that no additional knife switch need be installed for the complete separation of the motor from the circuit. This controller is made by the Cutler-Hammer Manufacturing Company of Milwaukee, Wis.

A Simple Meter Lock

A device which permits watt-hour meters to be connected in consumers' premises, and provides full protection from tampering by unauthorized persons for the purpose of using current through the meters until the usual arrangements have been made and at the same time prevents theft of current without meter registration is shown in the accompanying illustration. This meter lock, consisting of a pressed fiber guard and a dummy plug with a perforated rim for sealing, is applied to the fused service switch. With the fuse plugs removed and the dummy plug sealed in its position through the fiber guard the binding screws of the switch are so covered as to make the attachment of jumpers or by-passes impossible. The material of the guard is of such rigidity, it is claimed, and is so formed that it can neither be sprung nor twisted out of place without breaking the seat and removing the dummy plug. The lock is small and of so little weight that a workman can easily carry a day's supply in the pockets of his coat. This meter lock has been patented and is now being made by the Acme Meter Lock Company, 315 Minnesota Street, St. Paul, Minn.



METER SWITCH LOCK

Electrically Operated Toys

The Swedish-American Telephone Manufacturing Company, 5242 Ravenswood Avenue, Chicago, Ill., is offering an interesting line of electrically operated toys for the Christmas trade. Besides the regular assortment of Boy Scout telegraph instruments, wireless receivers, buzzers, flashlamp candlesticks and the like, the company has this year brought out toy ranges, electric toy engines and electric toy telephones.

FIG. 1—TOY TELEPHONE OF SIMPLE CONSTRUCTION

The range, Fig. 1, is 7.5 in. long, 4.125 in. wide, 8.5 in. high and weighs but 2 lb. 7 oz. packed. It has a plate shelf at the top and is equipped with cord, plug, attachable connector and two little cooking utensils. The heating element, which is rated at 275 watts, is arranged so that it can be easily removed and replaced. Cooking can be done in the oven on top of the stove.

The toy electric engine consists of two 2.25-in. magnets, which act on a lever bar and an eccentric to drive a 3.5-in. flywheel. The flywheel is copper-plated and the whole engine is finished in bright colors. When packed the engine weighs 2 lb. 4 oz.

The toy telephone, the manufacturer states, is the first electrically operated set of its kind. The instruments are made in both the wall type and desk type. The transmitter and receiver are of the simplest possible construction and yet are effective. They are equipped with push-button and electrical signal for calling, and can be used to talk between rooms or between house and garage or barn.

FIG. 2—ELECTRICALLY OPERATED TOY RANGE

NEWS OF THE INDUSTRY

A Review of Activities in the Electrical Manufacturing, Selling and Central-Station Fields

A.M.E.S. Lighting Fixture Section Committees

The lighting fixture section of the Associated Manufacturers of Electrical Supplies held a special meeting on Oct. 25 at the Hotel Biltmore, New York. W. D. Steele, of the Benjamin Electrical Manufacturing Company, Chicago, the new chairman of the section, presided. The following standing committees, covering the various lines of the fixture industry, were appointed:

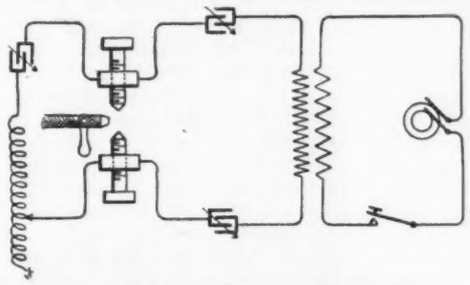
Committee on interior lighting fixtures:—L. Livingston, Edward F. Caldwell & Company, Inc., New York; W. H. Spencer, I. P. Frink, New York; A. F. B. Harraden, Shapiro & Aronson, New York; F. W. Wakefield, Wakefield Brass Company, Vermilion, Ohio; Albert Ullman, Scott-Ullman Company, Cleveland, Ohio.

Committee on industrial lighting fixtures:—C. O. Baker, Wheeler Reflector Company, Boston, Mass.; H. W. Bliven, Harvey Hubbell, Inc., Bridgeport, Conn.; D. K. Chadbourne, George Cutter Company, South Bend, Ind.

Committee on street lighting fixtures:—A. D. Fishel, Adams-Bagnall Electric Company, Cleveland, Ohio; W. H. Jones, General Electric Company, Schenectady, N. Y.; C. E. Stephens, Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa.

A Non-Arcing Electrode Generator for Sustained Waves

Father Joseph Murgas of Wilkes-Barre, Pa., in patent No. 1,196,969, proposes a modified form of Poulsen arc generator for undamped oscillation of high frequency that he claims gives an efficiency much in advance over the arc method hitherto employed. In fact, the arcing as such is claimed to be entirely suppressed. An alternating current of moderate voltage is stepped up to a high voltage and connected across the terminals of an arc or spark gap. Platinum or steel plugs are preferably employed, although carbon can be used. In shunt with the arc or gap is the well-known arrangement of an adjustable inductance and capacity, forming with



NON-ARCING ELECTRODE GENERATOR

the arc or gap the oscillating circuit. However, a strong air blast is used which performs a fourfold function. First it cools the electrodes and therefore allows a much smaller gap to be used, giving a higher frequency in the oscillating circuit; second, it increases the dielectric strength of the gap due to the higher air pressure; third, it completely blows out and extinguishes the arc, and fourth, it unites the discharge in one single thick discharge which is purely oscillatory in character, of very high frequency, and nearly noiseless, and therefore is well adapted for wireless telegraphy and telephony. The nozzle is connected by a tube to a pressure tank so that the air may be delivered at a comparatively high pressure, amounting to several pounds per square inch. The pressure of the nozzle is adjusted by a valve or any other convenient means.

Public Service Commission News

Illinois Commission

On Oct. 12 the States Public Utilities Commission issued rules establishing standards for overhead electrical construction. These rules cover all overhead electrical lines located entirely outside of buildings, and it is the intent of the commission in these rules to make as adequate provision as is possible for human safety, giving consideration to the reasonableness of the requirements. A perusal of the rules indicates that the commission feels co-operation among the various utility interests in the State is essential, and the rules require that where these interests conflict in overhead construction, both parties shall use their best efforts to co-operate with the conflicting interests.

It is provided that any utility feeling the rules are inapplicable to any proposed construction may come before the commission and present its reasons for such a belief, and if such reasons seem justifiable and reasonable, relief will be granted to as great an extent as is practicable in view of the other considerations which may influence the question.

The arrangement of the rules is such that it is believed reference may readily be made to the requirements covering any points of construction which may be under contemplation. Thus the rules are divided into seven sections, having captions as follows: Sec. I—"Preliminary"; Sec. II—"Overhead Construction in General"; Sec. III—"Construction at Crossings Between Wires"; Sec. IV—"Construction of Crossings of Wires Over Railroad Tracks"; Sec. V—"Crossings of Wires Under Railroad Structures"; Sec. VI—"Construction for Jointly-Used Pole Lines"; Sec. VII—"General Recommendations for the Construction and Operation of Supply Systems and Signal Systems Whose Lines Are Involved in Parallels."

The rules apply to all new construction, and further require that all existing construction shall be brought into conformity with the rules within ten years from the date of their issuance.

A factor of safety construction is required for steel tower lines. For wooden pole construction the requirements are stated so far as possible in non-technical language, in order that they may be more readily interpreted by the utility operator in small communities.

The rules contain requirements for the size of conductors, the sags of conductors, the spacing of poles, the depth of setting poles, and other similar features of overhead construction for each type of construction which the rules are intended to cover.

Technical Books of 1915.—Pratt Institute Free Library, Brooklyn, N. Y., has issued a booklet containing a selection of the technical books of 1915.

Electricity to Replace Gas for Street Lighting in Kansas City.—The municipal electric light department of Kansas City, Kan., has taken over the street lighting of the city. The Welsbach Street Lighting Company has until recently been lighting the streets with gas. There were 1417 gas lamps which will be replaced by electric lamps, material for which is already ordered.

Lamp Trimmer's Work in Chicago.—Under the union agreement in Chicago one trimmer with an automobile, for which he is allowed an amount for maintenance not to exceed $4 per day, patrols and replaces 1200 600-cp. incandescent lamps on underground circuits. A trimmer on foot patrols 500 flame-arc or 60-cp. incandescent lamps, trims 330 flame-arcs, or cleans 750 600-cp. incandescent lamps.

Massachusetts Tech. to Establish Research Laboratory at Niagara Falls.—The Carborundum Company of Niagara Falls, N. Y., will construct an administration building on lands of the Niagara Falls Power Company on the Niagara River front. It is proposed to tender the use of the present offices to the Massachusetts Institute of Technology, which has decided to establish a research laboratory at Niagara Falls.

Settlement of Montgomery Power Suit.—The United States Supreme Court has refused the writ of a *certiorari* sought by the Montgomery Light & Traction Company relative to the judgment of more than $100,000 awarded the Montgomery Light & Water Power Company by the Federal District Court. This judgment was for a contract for power which the traction company sought to have set aside.

Municipal Plant Asks to Be Allowed to Increase Rates.—Although it has been operating its electric light plant for less than a year and a half, the village of Black Creek, Outagamie County, Wisconsin, on Monday applied to the State Railroad Commission for authority to increase its electric rate schedule 50 per cent. The present lawful rate is 10 cents per kilowatt-hour. The Council asks that it be allowed to raise this to 15 cents per kilowatt-hour.

Failure of Gas Supply Again Booms Electric Cooking and Heating Apparatus.—The failure of the gas supply in Kansas City at the first touch of cold weather greatly stimulated the sale of electric cooking devices, which sale was further augmented through timely advertising. Practically all the stock of grills on hand in the Electric Shop of the Kansas City Light & Power Company were sold in a few days. In its advertising of the grills, the company emphasized the preparation of breakfast, but added that at a pinch a fairly good dinner could be prepared on it. The company also had a very heavy run on radiators during the early cold spells.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

New Heating Bulletin.—The heating and appliance division of the contract department of the Commonwealth Edison Company, Chicago, is issuing a monthly mimeographed bulletin entitled "Electric Heating and Cooking Notes." A. F. Allsop, the company's industrial heating engineer, is editor.

Union Labor Pickets Movie Show Which Uses Electrically Operated Piano.—Charles Papp and Joseph Maros, proprietors of a moving picture show in Cleveland, have asked the courts for an injunction against the International Alliance of Theatrical Stage Employees, Cleveland Federation of Labor and the Musical Mutual Protective Association. They allege that the house has been picketed by the labor organizations because an electrically operated piano is used to furnish the music and because Maros, one of the proprietors, operates the film machine. The organizations claim the house is unfair to labor.

Municipal Plant Furnishes Service to Competing Private Utility.—A short time ago the Tacoma Municipal Lighting plant commenced furnishing waste power to the Tacoma Railway & Power Company, on a special contract entered into for a brief period, it being understood that the city could discontinue the service at any time. The main facts of the contract are that the city would supply the power company from 4000 to 5000 kw. for ten hours at a rate of $20 per horsepower year, or about 0.3063 cent per kilowatt-hour. Under this arrangement, the city has since Sept. 20 been furnishing the company from 50,000 to 175,000 kw.-hr. daily, the largest demand having been 14,000 kw. The city has a permanent connection between its lines and those of the company, for mutual advantage in case of break. For this breakdown service, the two plants have a reciprocating contract based on 0.75 cent per kilowatt-hour. However, this contract does not prevent either of the parties from making special bargains for blocks of power from time to time. On this particular occasion, the power company found its river plant short of water and proposed, instead of starting its steam plants, to purchase energy from the city, which from the latter's standpoint was a case of selling surplus power which it had going over the dam. While the price is very low, yet viewed from a waste power standpoint, and the fact that service may be discontinued at any time, the proposition is understood to be very satisfactory to both parties.

Educating Indianapolis Architects.—At a dinner given by the Indianapolis (Ind.) Light & Heat Company to the leading architects and their wives on Oct. 27, George A. Hughes of Chicago was the speaker of the evening. His topic was the advantages of electric cooking in apartment houses. In the course of his talk Mr. Hughes showed illustrations of several types of electrically equipped kitchens in apartment houses already constructed in the West. He also exhibited several electrical load curves taken from apartment-house range installations. The dinner which was served to the guests was electrically cooked.

Winnipeg Holds Electrical Show.—There opened on Oct. 10 and continued throughout the remainder of the week at Winnipeg, Canada, the first large electrical exposition ever held in that city. Throughout the week the convention hall of the Industrial Bureau, where the exposition was held, was crowded with visitors. One of the attractions was the moving pictures showing the many uses of electricity in the home, factory and on the farm. There were also shown pictures of the power plants of the local lighting companies, the Winnipeg Electric Railway Company and the Municipal Electric Light Plant. Every effort was made to interest the consumer in electrical devices. Being essentially an educational exposition for the benefit of the public, the show was far from being technical.

Westfield (Mass.) Municipal Plant Investigation.—Following a recent increase in the price of electricity at the Westfield (Mass.) municipal lighting plant, a committee has been appointed to investigate the administration of the plant's affairs. It is reported that the committee will shortly hold a conference with the Massachusetts Gas and Electric Light Commission relative to the recent history and future prospects of the plant. Rumors are afloat to the effect that outside interests are prepared to take the plant off the town's hands in case the citizens desire to secure lower cost energy than the department can supply on the present basis of equipment and expenses. About three years ago one of the large hydroelectric companies operating in the Connecticut Valley made the town an attractive offer for the wholesale supply of energy to the lighting department, but the citizens voted instead to extend the existing plant. At the rates then quoted the purchase of outside power would have saved the town upward of $1,500 a year compared with the plan followed. The time is coming when the increasing business of the plant will necessitate further enlargement or the purchase of outside energy. The increase in rates put into effect in August of this year has tempered the enthusiasm of some of the citizens for further municipal plant extensions, and while no power purchase proposition is at present before the town, it is likely that the latter course will result from the investigation.

Risk Assumed by Lineman.—A servant employed to reset electric poles, requiring his climbing among live wires for the purpose of attaching a pulley to the old poles used in hoisting the new ones, is held (L. R. A. 1916 D, 962) to assume the risk of all ordinary dangers incident to so hazardous an employment, but not the risk of unknown and abnormal dangers due to the master's negligence, such as an uninsulated joint.

Wire Maintenance Negligence.—Notwithstanding the wires of an electric company were originally properly constructed, it was bound to maintain them in such condition as to prevent their coming in contact with other wires that might be thereafter stretched across the street, and also to keep them properly insulated, it was held by the Court of Civil Appeals of Texas (188 S. W. 289).

Status of Transmission Line in Eminent Domain Proceedings.—Land used for pole line for transmission of power to a public railway, is used for public purposes, although indirectly, it was held in (159 P. 992) by the District Court of Appeal for the Second District of California. Where an electric railroad entered upon lands without objection by the owners, and erected and maintained a pole line for transmission of power, the easement it acquired was a substantial property right, and on condemnation for park purposes the landowners could not have the entire compensation, the court held, but the railroad should share therein.

Employees Liability for Safety of Working Place.—Another link in an already long chain of decisions holding that employers must provide safe places for the employees to carry on their work is contained in the decision of the Court of Civil Appeals of Texas (188 S. W. 289). It was held by the court that the employer must furnish a reasonably safe place for employees to work, and a telephone lineman was not required to inspect a pole to ascertain whether it would be dangerous to climb it before obeying the commands of his superior. In a lineman's action for personal injury from an electric shock caused by an electric light wire coming in contact with a guy wire attached to a telephone pole, a charge by the lower court assuming that the lineman knew that the electric light wire was charged with electricity, was properly refused, it was held, where the evidence failed to show such knowledge. Also it was held that a request to require the jury to say whether contact of wires was due to the lowering of the guy wire or the raising of the electric light wire was properly refused, as the issue was immaterial. The electric light company's requested charge that it was not bound to provide a reasonably safe place for plaintiff to work, and could not be held liable for the negligence, if any, on the part of his employer in failing to do so, was also held to be properly refused where no such issue was raised by the proceedings. Such charge was properly refused, because in no event could the electric light company be responsible for the negligence of plaintiff's employer, a telephone company.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public-utility companies.

Release Granted By Injured Lineman.—That a release does not always release is evident from the decision of the Civil Court of Appeals of Texas (199 S. W. 289) in Gulf States Telephone Company versus Evetts. A lineman brought an action for injuries, where it appeared that his release to his employer was executed a few days after his injury, while he was in bed under the influence of medicines and suffering from his injury, and where there was evidence tending to show that he was then incapable of understanding the nature of his release. The court would not set aside a verdict for plaintiff and grant a new trial on the ground that the evidence was insufficient to show that plaintiff, when he executed the release, did not understand its nature and effect.

Excessive Damages for Injuries.—A verdict of $15,280.30 awarded to a lineman, twenty-four years of age, earning from $1.50 to $2 per day, with a reasonable expectation of greater earnings in the future, shocked by electricity, knocked unconscious, and severely burned about arm, chest and hand, and who suffered great pain for a considerable time, and who at the trial six months afterwards still had a fever, and whose arm was likely to be permanently useless and a menace to his health, whose weight was reduced and whose nervousness prevented sound sleep, in the absence of any showing that the jury were actuated by improper motives in reaching the amount of the verdict, was allowed to stand by the Court of Civil Appeals of Texas (188 S. W. 289).

Right of Abutting Owner in Shade Trees Within the Street.—How far a public utility may go in the matter of tree trimming in order to string its wires and what the rights of abutting owners are to the shade and ornamental uses of a tree, are not as big questions to-day as they were ten years ago, owing undoubtedly to the greater public spirit of the utilities. However, cases of this nature do arise in the courts, and one of particular interest was decided recently by the Supreme Court of Iowa in Newlands versus Iowa Railway & Light Company (159 N. W. 244). It was held by the court that an owner of residence property who rightfully planted shade trees within the street, and maintained them, except as against the superior right of the State by its proper authorities to maintain and improve the streets for public purposes, had a property right in them which the court would recognize and protect. The fact that a light company for the convenience of its electric line assumed the right to cut and destroy the trees carried no presumption that in doing so against will and protest of the resident it was acting within the authority of some franchise neither pleaded nor otherwise disclosed. Defendant, which had not pleaded or proved any right to "reasonably cut and trim" the trees could not contend that the damage was the difference between the value of the property as reasonably trimmed and its value if they had been destroyed, even if that rule was applicable. A claim of right to "trim" trees "under the instructions of the city council," if any, conferred no right to destroy and remove the trees.

Admission of Expert Evidence.—What constitutes expert evidence, when may it be used and of what value is it are common bases for appeal from lower court decisions. Admissions of certain expert testimony were made by the Supreme Court of Michigan in Sykes versus Village of Portland (159 N. W. 325). The court held that in an action against a village operating an electric light plant, and a telephone company, for an injury to the plaintiff from an electric shock while trying to rescue her son from contact with a fallen electric light wire which caused his death, the admission of the testimony of plaintiff's expert witness that a crossing of the electric light wire from 8 to 14 in. from the telephone wire, and in view of the long span too heavy for a pole to support without a guy, was dangerous, and that the wires would not be safe unless placed about 40 in. apart, was admissible over the objection that it involved the direct issue for the jury. In an action for injury from an electric shock, testimony of experts that a person might get a shock sufficient to knock him down without being burned, supplemented by the experience of one of the witnesses mainly drawn out by defendant's cross-examination, was admissible. In such action where the case as to the defendant's negligence was close, the admission of evidence of a non-expert witness as to his individual experience when shocked under other and different conditions, raising a collateral issue, was prejudicial error. Where plaintiff, on cross-examination of defendant's medical witnesses, elicited testimony that the plaintiff was not suffering from an organic disease or injury to the nerves or nerve centers, or any molecular change therein, evidence that witness knew it was claimed by some medical authorities that there might be a molecular change in the nerves from electricity, and that the contrary was also claimed, and that the question was undecided, thereby importing into the case the theory of some authority to refute the testimony of defendant's witnesses, was reversible error.

Los Angeles Jovians Elect Officers.—The Jovian League of Los Angeles at the regular meeting on Oct. 11 elected the following officers for the ensuing year: President, A. E. Morphy; vice-presidents, K. E. Van Kuran and Carl C. Young; secretary-treasurer, Clifton Peters.

Independent Telephone Convention in December.—The annual convention of the United States Independent Telephone Association will be held at the Hotel La Salle, Chicago, Ill., Dec. 5, 6, 7 and 8. The mornings will be given over to the exhibitors, and all meetings will be held in the afternoon.

New Mexico Electrical Association Executive Meeting.—At the executive meeting of the New Mexico Electrical Association, which was held in El Paso on Oct. 16, 17, 18, it was decided to hold the next convention on Feb. 12, 13 and 14 at Albuquerque, N. M. The sessions of the meeting and divers other details were taken up in the committee reports.

Institute of Radio Engineers.—A meeting of the Institute of Radio Engineers was held on Nov. 1, at the Engineering Societies Building, New York City. A paper by Bowden Washington and T. H. Boyster, on "A Determination of the Energy Losses in a Radio Telegraph Transmitter," was presented. The paper described a new method of determining heat losses in transmitters.

Steinmetz Addresses Chicago Engineers.—"When the forces of the warring nations are again released to commercial pursuits the United States must meet their prices with a co-operative front." This was the keynote of an address delivered by Charles P. Steinmetz before a joint meeting of the Chicago section of the A. I. E. E. and the Western Society of Engineers on Oct. 25.

Program Arranged for Season by Spokane Section of Institute.—F. S. Burroughs, formerly chief engineer of the Public Service Commission of Washington, addressed the first regular meeting of the Spokane section of the American Institute of Electrical Engineers on Oct. 18. The following papers will be delivered at later monthly meetings of the Spokane section: Nov. 24, R. W. Mastick, engineer, Pacific States Telephone & Telegraph Company, topic unannounced; Dec. 16, A. W. Fisher, electrical engineer, Inland Empire Paper Company, "Application of Electricity in the Manufacture of Paper"; Jan. 19, A. Lindsay and Morton MacCartney, city engineers of Spokane, "Municipal Engineering"; Feb. 16, E. A. Lindley, "The Preservation of Cedar Poles," and George Harding, "Concrete Reinforcing of Poles"; March 15, Miss Laura C. Addison, "Recent Developments in Electric Cooking"; April 21, "Transformers," by V. H. Greisser, electrical engineer, Washington Water Power, and "Electrolysis," by F. L. Rohrback, engineer in charge of city underground system. On May 18 the annual election of officers will be held.

Associations and Societies

The Directory of Electrical Associations, which is regularly printed in the first issue of each month, appears on page 935 of this number.

Utah Electric Club Discusses Proposed Ordinance.—There was continued on Oct. 26 from the previous week the discussion on the proposed local electric ordinance. F. D. Winegar opened the discussion.

Dallas Electric Club.—W. F. Ramsey, chairman of the board of directors and federal reserve agent of the Federal Reserve Bank, addressed the club at the Oct. 20 noon luncheon on "Federal Reserve Bank."

Pittsburgh Section I. E. S. Holds Symposium on Progress.—At the regular monthly meeting of the Pittsburgh section of the Illuminating Engineering Society, a symposium was held on the subject, "Progress in the Illumination Field as Indicated by the Illuminating Engineering Society Convention and the Lecture Course at the University of Pennsylvania." The speakers were J. L. Minick, Pennsylvania Railroad Company; Alan Bright, Macbeth Evans Glass Company; O. H. Eschholz, Westinghouse Electric & Manufacturing Company.

Alabama Utility Men Hold Successful Convention.—The annual convention of the Alabama Light & Traction Society, which was held at Anniston on Oct. 16 and 17, was one of the most successful gatherings in the history of the organization. Following the address of Theodore Swann, manager of the Anniston Steel Company, the members visited the electrical furnaces and the plant of the Anniston Ordnance Company.

President C. C. Henderson delivered his address on Tuesday. Other addresses were made by H. M. Cohn of the Birmingham Railway, Light & Power Company; Fred Stines, manager of the electric department W. M. Carey Mill Company, Atmore; H. H. Shickel of Montgomery, C. E. Burgess of Mobile and Thomas W. Martin, vice-president and general counsel, Alabama Power Company. The latter speaker took for discussion the laws of the State of Alabama relating to street railways, light and gas properties. With L. W. Jackson of the local division of the Alabama Power Company as host, the delegates went to Oxford Lake at noon and enjoyed a barbecue. Thomas W. Martin, Birmingham, was elected president of the society. The other officers are: A. R. Smith, manager, Demopolis Electric Light & Power Company, vice-president; J. P. Ross, secretary, Birmingham Railway, Light & Power Company, secretary-treasurer; executive committee, R. L. Ellis of Selma, J. L. Pevear of Birmingham, C. C. Henderson of Greenville and T. K. Jackson of Mobile.

Dallas Electric Club.—The Oct. 27 meeting was in charge of the Dallas Automatic Telephone Company. The speaker was Haton W. Sumners.

Local Jovian Officers for Chicago Elected.—At the meeting of the Electric Club - Jovian League of Chicago, Oct. 26, the following officers for the local Jovians were elected: First Tribune, H. A. Mott; second tribune, George N. Nelson.

Cleveland Electric League Establishes Educational Classes.—The board of directors has arranged for the establishment of three educational classes under the heads of sales round table, public speaking and E. M. F. These classes will meet on separate evenings and will be in charge of men well posted in the three divisions of work. Prof. H. B. Dates of Case School of Applied Science will have charge of the E. M. F. class, which will pursue studies in the theory of electricity.

Western Contractors and Dealers Conference Board.—The first meeting of the Western Conference Board of Contractors and Dealers, held in San Francisco on Oct. 26, gathered a list of the problems confronting the industry, and which are common to all the Pacific Coast States. The board will, through its several members, work out plans for the co-operation of the several State organizations. One representative from each of the Pacific Coast associations was present. As now organized the board is as follows: Chairman, H. C. Reid, Pacific Fire Extinguisher Company, San Francisco; secretary, John Tomlinson, Pierce-Tomlinson Electric Company, Portland; G. B. Arbogast, F. P. Newberry Company, Los Angeles; Henry C. Rohrback, Electric Service Company, Tacoma, Wash., and C. H. E. Williams, British Columbia Association of Electrical Contractors and Dealers, Vancouver, British Columbia.

Joint Meeting of California Electrical Contractors and Dealers.—The regular monthly meeting of the California Association of Electrical Contractors and Dealers was held in San Francisco on Oct. 26. At the banquet in the evening representatives of the central stations, jobbers and their salesmen, and representatives of the Hardware Dealers' Association and Master Plumbers' Association were invited. Brief talks on problems in the various phases of electrical merchandising and construction were made by men engaged in various branches of the industry, the endeavor being to show how the best results could be secured from co-operation. Representatives of dealers' and contractors' associations from the north and the south of the Pacific Coast, as well as representatives of the Plumbers' and Hardware Dealers' Associations of California also were called upon for comment that would lead to closer co-operation. The chief speaker of the evening was H. C. D. Dohrmann, who discussed in a way very helpful to the electrical dealer the experience he had gained in managing the ten department stores of his company located in various Pacific Coast cities.

REVIEW OF TRADE AND MARKET CONDITIONS

News of the Trade for the Manufacturer, Wholesaler and Jobber of Electrical Equipment and Supplies—Notes on Industrial Activities and Business Methods

ELECTRICAL EXPORTS FOR AUGUST BREAK RECORD

Value of Generator, Insulated Wire and Cable, Meter, Telegraph Material and Miscellaneous Apparatus Shipments Greatest Since Beginning of Year

Exports of electrical equipment during the month of August last reached the record total of $3,595,735. The largest previous month was May, when the value of electrical goods shipped abroad was $3,437,609, or over $150,000 less than the August total.

Compared with August, 1915, figures those for 1916 take on a still brighter aspect. In August, 1915, the value of electrical goods exported was $1,806,292, so that the August, 1916, exports were practically 100 per cent greater than those for August, 1915. In almost every line the August, 1915, exports were greater than those of a year previous. The only exceptions were generators where the difference was a little more than $300, and carbon filament lamps where the difference was around $13,500.

Articles	August		Eight Months Ending August	
	1915	1916	1915	1916
Electrical machinery, appliances and instruments:				
Batteries	$114,516	$161,513	$864,001	$1,174,003
Generators	216,906	216,626	1,449,523	1,021,419
Fans	15,453	34,333	230,721	231,638
Insulated wire and cable	251,083	406,526	1,764,300	2,498,372
Interior wiring supplies, etc., including fixtures	49,202	80,707	605,166	574,784
Arc lamps	1,633	1,672	16,845	11,964
Carbon-filament lamps	17,221	3,747	97,420	64,029
Metal-filament lamps	74,119	107,571	420,595	980,098
Meters and other measuring instruments	57,244	89,579	396,237	538,847
Motors	277,940	402,489	2,043,625	3,137,275
Telegraph instruments (including wireless apparatus)	17,030	25,488	74,683	110,090
Telephones	50,841	124,234	682,920	1,147,860
Transformers	29,146	107,619	375,230	698,684
All other	633,958	1,833,631	5,955,393	11,339,560
Total	$1,806,292	$3,595,735	$14,976,659	$23,528,623

In a few classes of goods the August, 1916, exports were the greatest in value of any month during the current year. These classes were generators, insulated wire and cable, meters, telegraph material and miscellaneous merchandise.

During the first eight months of the current year electrical exports have had a value of $23,528,623 in comparison with $14,976,659 and $13,654,569 during the corresponding periods of 1915 and 1914 respectively.

A comparison of the separate items in the accompanying classification during the first eight months of 1914, 1915 and 1916 discloses the fact that in almost every line the value of American electrical exports is increasing. Particularly is this evident in the exports of batteries, insulated wire and cable, metal filament lamps and miscellaneous equipment. On the other hand, the foreign demand for American-made generators is apparently decreasing. In the first eight months of 1914 the value of generators shipped abroad was $1,746,665, in the corresponding period of 1915 it was $1,449,523, while in the current year to Aug. 31 it was $1,021,419.

Estimates based on the exports to Aug. 31 last place the 1916 exports at over $35,000,000, the largest year in the history of American manufacture of electrical goods.

Nevertheless, it must be remembered that these figures are for values only, and in a year with such price inflations as are now being experienced values are of little worth for comparative purposes. In some lines there have been marked increases both in volume and value. The most notable instance of this is in the export of metal-filament lamps. During the first eight months of 1914 but 478,493 of these lamps were exported, and in the corresponding months of 1915 the volume ran up to 2,377,698 lamps, while in the first eight months of the present year the exports were 5,528,806 lamps.

If it were possible to compare actual volumes of goods, which is really the only true comparison, then it is certain that no such difference would exist as is indicated by values in most of the lines. On the other hand, it is quite probable that the American export trade in electrical goods would show itself to be less than during normal months preceding the war.

The accompanying figures were obtained from the monthly summary of foreign commerce compiled by the Bureau of Foreign and Domestic Commerce for August, 1916.

WESTERN ELECTRIC FAN WINDOW CONTEST AWARDS

Company Offered Dealers Window Ideas and Trim, and Paid Them for Adopting Up-to-Date Selling Methods—Kansas City Dealer Wins $100 First Prize

A notable example of the service which the distributors of electrical merchandise are rendering to the electrical dealer and merchant to encourage the adoption, by the retailer, of modern merchandising methods which make for a larger volume of sales, is the fan window contest which has just been closed by the Western Electric Company with the award of $250 in prizes for the best ten window displays submitted.

Not only were direct dealer helps for window trim and suggestions for their use furnished in this instance, but through the prize contest, open to any retailer of fans, the dealer was actually rewarded in cash for his adoption of the up-to-date merchandising suggestions spread before him. Aside from the window-display outfit, which included display cards, signs, stickers, ribbons, etc., the Western Electric Company offered the dealer a complete set of electrotypes for newspaper "ads," folders, and lantern slides for motion-picture-show publicity.

The rules of the 1916 fan-window contest provided that the window displays be judged by their probable ability to attract genuine interest to electric fans. Photographs of the show windows were to be mailed to the company's office by Oct. 1 and in addition to the prizes the company offered to pay $1 cash for each photograph submitted. Representatives of the electrical press and the Society for Electrical Development acted as the judges in the contest.

The first prize, $100, was unanimously awarded by the judges to the Wheeler Company, electrical dealers, Kansas City, Mo., which had offered a novel display showing a toy "trainload of breezes from the cool Alaska seas" being delivered to the sweltering city. Second prize, $50, went to the New Orleans Railway & Light Company; third prize, $25, to L. S. Ayres & Company, Indianapolis, Ind.; fourth prize to the Sanner Hardware Company, Shamokin, Pa. The remaining six prizes, each amounting to $10, were awarded, in the order named, to Shotwell, Bennett & Williams, Wilkes-Barre, Pa.; Central Electric Company, Watsonville, Cal.; St. Clair County Gas & Electric Company, Belleville, Ill.; the Electric Shop, Park Ridge, Ill.; Marshall Electric Company, Marshalltown, Iowa, and the North Avenue Electric Shop, Chicago, Ill.

INCLOSED ARC-LAMP MARKET VANISHING

New Gas-Filled Lamp Fast Superseding Older Type of Illuminant for Street and Factory Lighting

With the advent of the gas-filled incandescent lamp the future of the ordinary inclosed arc lamp as a commercial product dwindled away. Ordinary tungsten lamps of the vacuum type had been competing with the inclosed arc lamp but not with the degree of success that has attended the gas-filled unit. This new type of lamp has superseded the ordinary inclosed arc lamp for both street and factory lighting.

Therefore but few arc lamps are now being purchased. Where there are existing installations there is an occasional demand for a lamp or two for extensions or replacements. Many manufacturers are no longer pushing arc lamps, and salesmen of one of the larger companies are urged to convert arc-lamp installations wherever possible into gas-filled installations. As it is now, with a number of arc-lamp installations in use, manufacturers must maintain a certain stock of parts for repairs and also an appreciable stock of lamps to take care of additions and replacements. As the number of arc lamps in use, however, is diminished the necessity for keeping large stocks will decrease.

The new incandescent lamp has replaced the arc for a number of reasons. In the matter of annual cost and upkeep there has been considerable heated discussion on both sides, but it is now rather generally conceded that the gas-filled unit is more economical than the inclosed arc lamp. In the matter of outages and safety to trimmers the new lamp, of course, is superior. Furthermore, there are no carbons to deal with in incandescent lighting. Another reason, however, that has had no little share in popularizing the incandescent lamp is the development of ornamental lighting standards. The ornamental standard of both the single lamp and the cluster type has grown in popularity since the incandescent tungsten lamp was introduced. The luminous arc, however, has also become popular and is being used in large cities.

Moving picture houses and theaters are now the largest purchasers of arc lamps but there, too, the incandescent lamp is beginning to compete so that there seems every reason to believe that before long the inclosed arc lamp, as it is now known, will be a thing of the past.

STANDARDS FOR POCKET FLASHLAMP BATTERIES

Rules Recently Prescribed by Union of German Manufacturers Correspond with Recognized Practices of American Manufacturers

In conjunction with the German Union of Pocket-Lamp Battery Manufacturers, the *Verband Deutscher Elecktrotechniker* has issued a set of standard rules for three-cell pocket-flashlamp batteries. A comparison of these rules with American practice shows little difference. The German battery is slightly larger, being 2 mm. longer, 1 mm. wider and 1 mm. higher. German batteries, however, are made to fit the cases very snugly, whereas the American manufacturers allow a bit of play. Both American cases can be used with German batteries and American batteries can be used to refill German made cases.

Another difference is the longer side brass contact on German batteries. Also in the method of packing, the German manufacturer must place a guarantee strip over the longer contact. This permits testing, but the battery cannot be used until the guarantee strip is removed. The American battery is put up in a sealed carton with two small holes at the top to permit easy testing of the batteries. Both German and American practice demand practically the same tests and same life.

The battery for which these rules are laid down, it is interesting to note, is not a type that finds the best demand in the United States, although it is by far the best seller in Germany and German markets. In the United States a smaller type, being more attractive, is in greater demand.

The German rules, according to the London *Electrical Review*, prescribe that the standard three-cell battery, made up in rounded rectangular form, shall have the following overall dimensions excluding contact springs: Length 62 mm. (2.44 in.), breadth 21 mm. (0.827 in.), height 65 mm. (2.56 in.), with slight variations permitted. Contact strips are to be of rust-proof springy metal and 7 to 8 mm. (0.275 to 0.315 in.) in width; the shorter strip is to be 18 to 20 mm. (0.709 to 0.787 in.) long, and the longer strip 40 to 45 mm. (1.575 to 1.772 in.) The top of the battery must be covered with a suitable material, and each battery must bear a mark showing its origin and when manufactured.

On delivery from the works the rules provide that the electromotive force of the battery should be at least 4.5 volts, and should not exceed 4.8 volts. Provided the battery be stored and handled carefully its electromotive force should not fall below 4.2 volts during the first fourteen days after delivery, but it cannot be held to be unsatisfactory if it falls below this value after four weeks, the electromotive force being measured by a direct-current precision instrument having a resistance of at least 100 ohms per volt of range. The internal resistance of a new battery must be so low that on connecting the terminals through a resistance of 15 ohms the electromotive force falls by not more than 0.6 volt below the initial value of 4.5 volts. Every battery must be marked with the useful burning hours on continuous discharge and on intermittent discharges; these figures should refer to a temperature of about 20 deg. C. and to the battery as freshly delivered from the maker. When testing continuous discharge the battery is to be connected to a resistance of 15 ohms, and discharge is to be taken as complete when the terminal potential difference has fallen to 1.8 volts. The actual life on continuous discharge may be increased by 40 per cent to arrive at a value for the life on intermittent discharge.

For manufacturing reasons, battery cases may be dated ahead by eight days, but not by any longer period. It is advised that the best method of indicating whether a battery has been used or not is to place a guarantee-strip over the longer contact so that the battery cannot be used without tearing away this strip. A notice should be printed on the slip that the battery must be tested before the strip is removed and provision must be made, so that testing is possible. Electromagnetic voltmeters of the watch type are quite unsuitable for testing dry cells, owing to their inaccuracy and high current consumption. A higher initial electromotive force than 4.8 volts may easily be attained, but it is of no advantage, because it will soon decrease, and while it endures may burn out the lamp filament; an initial electromotive force higher than 4.9 or even 5 volts is very undesirable. The minimum of 4.5 volts is prescribed for final works test, and batteries which just pass this test will not yield 4.5 volts when received by the purchaser. If the latter is at a distance he should take care that batteries are received and tested within two weeks from the date of the works test, otherwise it may be impossible to get claims for defective cells admitted by the works within the four weeks specified as the longest period within which a battery may be expected to yield an electromotive force of 4.2 volts. Batteries should be stored in a cool, dry place, and neglect to do so frees the manufacturer from responsibility for rapid deterioration.

An average life figure for a batch of the same type, and made from the same lot of materials, may be obtained by taking the mean result of tests on three or five batteries. About one in 1000 batteries delivered is generally tested for burning hours. The test is made on cells perhaps three days old, and the life then indicated cannot be obtained when the batteries are three or four weeks old.

In marking the life on the battery case, it should be given as the hours of continuous burning for a 3-5 volt, 0.2-amp. lamp, since this basis of reference is understood more generally than the meaning of 15 ohms. In actual service pocket-lamp batteries are almost invariably used intermittently, perhaps for a total of five to ten minutes per diem with long periods for recovery. Numerous tests show that under such conditions the total useful life is at least 40 per cent longer than on continuous discharge, say three and a half hours as compared with two and a half hours.

Manufacturing and Industrial

The Carbo Corporation, manufacturers of patented steel supporting systems, announces that it has moved its main office from the Rand McNally Building, Chicago, to its factory at Chicago Heights, Ill., in order to fill its numerous post and pole orders more promptly. By making this step the company will be able to keep in closer touch with factory operation.

Catalogs for Valparaiso, Chile.—The Bureau of Foreign and Domestic Commerce advises that the National City Bank of New York will soon open a branch in Valparaiso, Chile, and that it will be glad to receive catalogs of American manufacturers to be placed on file for the use of interested parties. Copies of catalogs should be sent postpaid to the National City Bank of New York, box 1508, Valparaiso, Chile.

Plain Cast-Iron Post Proving Good Seller.—The George Cutter Company, South Bend, Ind., has stated that its new style plain, cast-iron post, known as the "Arcadian," is proving popular. This type of standard, which is free from the usual scroll work, has been recently purchased for four installations. They are: Charlevoix, Mich., which purchased sixty-one posts; Bay City, Mich., 104 posts; East Aurora, N. Y., fifty-three posts, and Iowa State College campus, forty-four posts.

Hurley Machine Company's Rapid Growth.—The Hurley Machine Company of Chicago has just added another 30,000 sq. ft. of floor space to its factory and installed $42,000 worth of new plant machinery. The company now occupies the entire building (except the ground floor), in which it started in 1907 with but 15,000 sq. ft. of floor space. Including that portion just leased the company's factory space to-day totals 105,000 sq. ft. The factory has been running twenty-four hours a day for the last four months, and the daily output is now about 150 washing machines.

Bosch Company Expands Again.—Closely following the announcement that the Bosch Magneto Company had started a second addition on its Springfield works comes the news of its purchase of a large plot of ground in Chicago, upon which the company will build a new and enlarged branch building. The erection of a new building has been rendered necessary largely by the big increase in general business of the middle western section. The present location, which is at Michigan Avenue and Twenty-fourth Street, having an area of 6000 sq. ft., will be vacated about Dec. 1 for the new branch building located upon the corner of Michigan Avenue and Thirty-seventh Place. Nearly 15,000 sq. ft. of floor space will be provided, which is about two and a half times as much as is now available. A new installation department will be opened, since the demand for the installing of car lighting, starting and ignition systems is growing considerably, and requires special accommodations. In this respect, the branch will be able to accommodate five times as many cars as heretofore. The spare parts, sales and repair departments will be on the main floor, as well as the stockroom, the disassembling, washing and testing department, packing department and installation department. The second floor will house the reception room, manager's office and trade department, as well as the superintendent's office, general office, financial department and drafting room.

Rathbone, Sard will Erect Large Structure.—The Rathbone, Sard Electric Company, Inc., Albany, N. Y., will take over the property of the Interstate Storage Company, situated on Rathbone and Thacher Streets, just north of Rathbone, Sard & Company, on North Ferry Street. This property has buildings on it now containing over 50,000 sq. ft. of floor space. The new company is planning to put a modern building on a portion of the property, which is now vacant. The present plant of Rathbone, Sard & Company will continue the manufacture of Acorn gas stoves and the new plant will be devoted entirely to the manufacture of the Acorn electric range. At present the factory has an output capacity of between 15,000 and 20,000 ranges a year, and this will be materially increased when the electric range works are in running order. The new Albany industry will give employment to 500 men. The new company will be run entirely independent from Rathbone, Sard & Company. At the first meeting of the company held recently directors were elected as follows: Ellery A. Baker, Arthur M. Blanchard, H. P. G. Norstrand, Russell E. Sard and W. H. Webster. The following officers were elected: Russell E. Sard, president; H. P. G. Norstrand, vice-president and general manager; W. H. Webster, vice-president; Arthur M. Blanchard, secretary and treasurer. Mr. H. P. G. Norstrand, the general manager of the new company, has been identified with Rathbone, Sard & Company for eleven years in the capacity of general superintendent and as manager of the electric stove department. The new company will specialize in electrical appliances, particularly stoves and bake ovens.

NEW YORK METAL MARKET PRICES

	Oct. 24 Selling Prices Bid	Oct. 24 Selling Prices Asked	Oct. 31 Selling Prices Bid	Oct. 31 Selling Prices Asked
Copper	£ s d	£ s d	£ s d	£ s d
London, standard spot	124 0 0		124 0 0	
Prime Lake	28.25	to 28.50†	28.25	to 28.50†
Electrolytic	28.50	to 28.75†	28.50	to 28.75†
Casting	27.12½	to 27.37½†	27.25	to 27.50†
Copper wire base	33.00†		33.00†	
Lead	7.00		7.00	
Nickel	50.00		50.00	
Sheet zinc, f.o.b. smelter	15.00		16.00	
Spelter, spot	10.17½	to 10.42½†	10.30	to 10.55†
Tin, straits	41.87½		....	
Aluminum, 98 to 99 per cent.	59.00	to 61.00†	58.00	to 60.00†

OLD METALS

Heavy copper and wire	23.00	to 23.50†	23.00	to 23.50†
Brass, heavy	13.50	to 13.75†	13.50	to 14.00†
Brass, light	10.50	to 10.75†	10.25	to 10.50†
Lead, heavy	5.87½	to 6.00†	5.87½	to 6.00†
Zinc, scrap	6.00	to 6.50†	6.50	to 6.75†

COPPER EXPORTS

Total tons to Oct. 31 29,160

†Nominal.

Corporate and Financial

Brazilian Traction, Light & Power Company, Toronto, Canada.—An issue of $7,500,000 of three-year 6 per cent secured gold notes, due Nov. 1, 1919, is being issued at 99 and interest.

Cities Service Company, New York, N. Y.—The company has proposed a charter amendment to its stockholders which, if carried, will put the preferred stockholders on a more solid basis. The investment of preferred stockholders is backed by excess earnings which represent several times the total dividend requirements on the total amount outstanding. In addition, however, the proposed charter will give them double this protection. This had always been the announced policy of the Cities Service Company, which could, however, be changed by subsequent boards of directors. Consequently it was thought better to amend the charter and make this policy a legal obligation. This action in no wise affects the announced stock dividend policy for the common stockholder. The method of strengthening the stability of the Cities Service preferred stock will be to reinvest all earnings in excess of the 6 per cent dividend on the common stock.

Consolidated Gas, Electric Light & Power Company of Baltimore, Md.—This company has given formal notice to stockholders that it will exercise its right to redeem its preferred stock at $120 on April 2 next, and offered to buy the shares at any time on and after Nov. 17, but before April 1 at $120 and accrued dividend to date of purchase.

The Manhattan Electric Supply Company, New York.—The company has announced the sale of $1,500,000 cumulative 7 per cent first preferred stock to Chandler & Company, Inc., of New York and Philadelphia, which will take over the business of the present company as a going concern. The former company owns and occupies a building at 17 Park Place, New York, operates two large manufacturing plants in Jersey City and two in northern Ohio, also retail stores in New York, Chicago and St. Louis, with a sales office in San Francisco. This business was founded in 1889, with a capital of $1300. Gross sales for the year 1901 were about $700,000; for 1915, $3,600,000, and for 1916 about $4,300,000. Marwick, Mitchell, Peat & Company, chartered accountants, report that, based upon the examination of the accounts and assets of the company as of Aug. 31, 1916, net earnings subject to dividends for

the eight months ended on that date were $358,059.81, and at a rate of more than five times the first preferred dividend requirements. The average annual earnings for the two years and eight months to Aug. 31, 1916, as reported by the auditors, were in excess of four times the first preferred dividend. The new company will have net tangible assets, as of Aug. 31, 1916, of $2,490,000, or $166 for each share of first preferred stock, and net quick assets of more than $1,600,000, or $106 per share. Cash in bank, as reported by auditors, as of Aug. 31, 1916, amounted to $489,847. The new company will have no mortgage or funded debt of any kind. The articles of incorporation will provide that no bonds or securities having priority to the first preferred stock may be issued, nor preferred stock increased without written consent of at least three-fourths of the issued and outstanding stocks of all classes. A sinking fund, beginning Oct. 1, 1917, of $30,000 per annum, payable $7500 quarterly to and including Jan. 1, 1921, and thereafter $40,000 per annum, will be applied to the retirement of first preferred stock at not over $112.50 per share.

Missouri & Southern Utilities Company, Blytheville, Ark.—John H. Watkins, New York City, has purchased the company's property, which consists of six light and power plants in Arkansas and Missouri. The transfer of the property was effected on Oct. 14.

Northern Ohio Electric Corporation, Akron, Ohio.—An issue of $6,000,000 of 6 per cent cumulative preferred stock, carrying half as many shares in common stock without par value, is being offered for subscription at the rate of ten shares of preferred and five shares of common for $1000. The corporation is to be organized to acquire not less than 95 per cent. of the common capital stock of the Northern Ohio Traction & Light Company.

Saline Electric Company, Chicago, Ill.—An issue of $500,000 of first mortgage sinking fund 6 per cent gold bonds, dated Sept. 1, 1916, and due Sept. 1, 1926, is being offered at par and interest.

New Utility and Industrial Companies

The Electric Converter Company of Toledo, Ohio, has been incorporated with a capital stock of $50,000 by M. L. Groves and others.

The Germantown (Ill.) Electric Light Company has been chartered with a capital stock of $10,000 by Harry Schurman and others to supply electricity in Germantown.

The Walapai Light & Power Company of Phoenix, Ariz., has been incorporated with a capital stock of $50,000 by Robert Roe, Arthur Fay, A. L. Cox and others.

The Venus Dry Storage Battery Company of Detroit, Mich., has been incorporated with a capital stock of $26,000 by William J. Malloy, Muir B. Duffield and Frederick O'Hearn.

The Silex Company of Boston, Mass., has been chartered with a capital stock of $150,000 to manufacture electrical machinery. The incorporators are: John T. O'Hare and Hazel M. Bridges.

The Union Electric Steel Company of Wilmington, Del., has been incorporated with a capital stock of $350,000 by Herbert E. Latter, Norman P. Coffin of Wilmington, Del., and Clement M. Egner of Elkton, Md.

The National Insulate Company of New York, N. Y., has been chartered with a capital stock of $50,000 to manufacture insulating materials. The incorporations are I. S. Beck, S. S. Hamburger and P. Meyer, 105 West 120th Street, New York, N. Y.

The No-Glar-On Company of Watertown, N. Y., has been incorporated by F. M. Williams, A. B. Williams and C. G. Willis of Watertown. The company is capitalized at $100,000 and proposes to manufacture an electric blub that will eliminate glare.

The C. D. Babcock Company of New York, N. Y., has been incorporated by C. W. Fairbank, C. D. Babcock and J. Neilson of Larchmont. The company is capitalized at $10,000 and proposes to manufacture electrical machinery, supplies, motors and wireless apparatus.

The Interstate Electric Construction Corporation of Albany, N. Y., has been chartered with a capital stock of $5,000 by W. R. Condon, J. J. O'Connor, W. H. Crowley, 336 Second Street, Albany, N. Y. The company proposes to do a general contracting business; electricians, agents, motors, machinery, etc.

The Fahn-McJunkin of New York, N. Y., has filed articles of incorporation with a capital stock of $500,000 to do designing, building, etc., also to deal in electrical machinery, appliances, etc. The incorporators are, E. R. Copper, 50 East Forty-first Street, New York, N. Y., and R. H. F. Streasau, 31 Washington Street, Brooklyn, N. Y.

The Electrolytic Works of America has filed articles of incorporation under the laws of the State of New York with a capital stock of $500,000 to manufacture electrolytic chemicals under process discovered by Richard Rodrian, throughout the United States, Canada and Mexico. The incorporators are: J. Speth, F. Frank and H. Wehmann, 277 Third Avenue, New York, N. Y.

Trade Publications

Paint Gun.—The Spraco paint gun, made by the Spray Engineering Company of Boston, Mass., is well described and illustrated in a booklet recently prepared.

Semi-Dry Cell.—The Burn-Boston Battery and Manufacturing Works, 134 State Street, Boston, Mass., has issued a leaflet on its new recharge semi-dry cell.

Instruments.—Circular No. 1, descriptive of the Northrup Pyrovolter, has just been issued by the Pyrolectric Instrument Company, 148 East State Street, Trenton, N. J.

Guards and Reflectors.—Harvey Hubbell, Inc., Bridgeport, Conn., has issued a leaflet, dated Oct. 16, 1916, containing revised list prices on Hubbell guards and brass reflectors.

Jacks.—"Simplex Jacks" is the title of a bulletin issued recently by the Templeton, Kenly & Company, Ltd., Chicago. The text is well illustrated and shows many actual performances.

Conduit Fitting.—The Dongan Electric Manufacturing Company of Detroit, Mich., has issued an illustrated leaflet descriptive of "Trancolet" fittings for bell-ringing transformers.

Electric Ranges and Hot Plates.—The Rutenber Electric Company, Marion, Ind., has issued a catalog giving specifications and prices of all its electric ranges, hot plates and other appliances.

Ammonia Compressors.—The De La Vergne Machine Company, foot of East 138 Street, New York City, has issued two illustrated bulletins describing its high-speed horizontal ammonia compressors and type "F H" crude oil engines.

Transformer Installations.—The Maloney Electric Company, St. Louis, Mo., has issued a thirty-two-page booklet which shows pictures of thirty power transformer installations. These large reproductions of unretouched photographs contain many engineering suggestions of merit.

Electrical Supplies.—"The Farmer's Electrical Hand Book" is the title of a 160-page catalog prepared by the Western Electric Company. The text contains such electrical information and practical working directions as every farmer and country resident will find useful.

Railway Equipment.—Bulletin No. 44001-J to supersede bulletin No. 44001-I, a price list of renewal parts and supplies for car equipments, mine locomotives, and railway and mine line material has been prepared by the General Electric Company. This company has also issued bulletin No. 45104 describing type H subway transformers.

The Kelvin Engineering Co., Inc., 32 Broadway, New York City, have published a bulletin illustrating and describing some of the work they have done in sugar-mill electrification and the results they have accomplished. They show by actual test data the economic comparison of modern electrification with the older steam drive. The bulletin also illustrates and describes their sugar house apparatus, multiple effects, evaporators, vacuum pans, etc. This bulletin is printed in both English and Spanish.

New England

FRANKLIN, N. H.—Byron B. Tobie and associates have acquired a water power privilege and 200 acres of land on Smith River at Profile Falls, with a view of developing the water power and installing an electric generating plant.

BOSTON, MASS.—The Somerville Lighting Company has submitted a proposal to Mayor Curley offering to heat the Pemberton Square Court House at a saving of $35,220 in the next five years. The company is now lighting the building under a special contract.

BOSTON, MASS.—Bids will be received at the office of the schoolhouse commissioners of the city of Boston, 1007 City Hall Annex, until Nov. 10, for construction of an elementary school for upper grades, Robert Gould Shaw District, Mount Vernon Street, West Roxbury, Boston. A complete set of plans and specifications may be obtained upon deposit of $25. A deposit of $15 will be required for a set of heating and ventilating or electrical plans with specifications.

HAVERHILL, MASS.—A permit has been granted to the Haverhill Box Board Company for construction of a power house on Railroad Avenue, Bradford district, to cost about $29,000. R. H. Hibbard of Boston has the contract.

HOUSATONIC, MASS.—F. T. Ley & Company of Springfield have been awarded the contract for foundations for the new power plant for the Monuments Mills.

PEABODY, MASS.—The contract for alterations and improvements to the municipal electric-light plant has been awarded to the Mark E. Kelley Company, 30 Beckett Street, Boston, Mass. The cost of the work is estimated at $40,000.

RANDOLPH, MASS.—The Randolph & Holbrook Light & Power Company has applied to the State Board of Gas and Electric Light Commissioners for permission to issue $40,000 in capital stock.

SPRINGFIELD, MASS.—The MacArthur Concrete Pile & Foundation Company of Boston, Mass., has the contract for driving piles for the foundation of a power plant at 33 Morris Street for the William Carter Company. The cost of the building is estimated at about $12,000. The Harry M. Hope Engineering Company of Boston are engineers.

HARTFORD, CONN. — The Hartford Electric Light Company contemplates extensive alterations at its Dutch Point generating station next spring. Among the changes considered are the addition of a 10,000-kw. turbine, the installation of a corresponding complement of boilers, replacement of some auxiliaries, alterations in the switching equipment and addition to the bus compartments.

Middle Atlantic

BROOKLYN, N. Y.—Bids will be received by William Williams, commissioner water supply, gas and electricity, Municipal Building, New York, N. Y., until Nov. 9 for reserving and furnishing electrical generating capacity current and equipment for the use of the high-pressure fire service pumping stations for the year 1917. Blanks, forms of bid, etc., may be obtained at the above office.

BROOKLYN, N. Y.—Bids will be received at the Bureau of Supplies and Accounts, Navy Department, D. C., until Nov. 14, for furnishing fuel-oil apparatus, water tube boilers, electrical cable, wire and elevating gear, fire extinguishers, frogs and switches, fuses, pipe-threading machines, radio-transmitting sets, steel shafts, voice tubing, etc., at the navy yard, Brooklyn, N. Y. Proposal blanks may be obtained on application to the supply officer, navy yard, Brooklyn, or to the above bureau.

BUFFALO, N. Y.—At the November election the proposal to have the municipality own and operate an electric-lighting plant and conduit system, to generate, sell and distribute electricity to consumers and lease conduits, etc., will be submitted to the voters. The proposal to ask the Legislature to pass an act enabling the city to own and operate a municipal telephone system will also be voted on, and also the proposed merger of the four telephone systems in the city.

FLUSHING, N. Y.—Bids will be received by C. B. J. Snyder, superintendent of school buildings, Department of Education, Park Avenue and Fifty-ninth Street, New York, until Nov. 13, for installing exhaust ventilating apparatus, and electric ash-hoist in Flushing High School. Separate proposal to be submitted for each item. Blank forms, plans, etc., may be obtained at the above office.

Construction

News of Projects, Plans, Bids and Contracts. Notes on Work Under Way

LONG ISLAND CITY, N. Y.—Plans are being considered by the Latham Lithographing & Printing Company for the erection of a factory and power house, 220 ft. by 300 ft., and 50 ft. by 50 ft., respectively, in Long Island City. Peuckert & Wunder, 310 Chestnut Street, Philadelphia, Pa., are architects. Edward Wenning, 148 Thirty-ninth Street, Brooklyn, is secretary of the company.

LYONS, N. Y.—The New York Central Railroad Company is planning to install an electric turntable, which with equipment will cost about $45,000, in its yards at Lyons. New buildings, to cost about $4,000, will be erected.

NEW YORK, N. Y.—Bids will be received by William Williams, commissioner of water supply, gas and electricity, Room 2351 Municipal Building, New York, N. Y., until Nov. 9 for reserving and furnishing electrical generating capacity, current and equipment for use of the high pressure force service pumping stations in borough of Manhattan for the year 1917. Blank forms of bid, proposals, etc., may be obtained at Room 2334, Municipal Building.

NEW YORK, N. Y.—Bids will be received by the Board of Trustees of Bellevue and Allied Hospitals, 415 East Twenty-sixth Street, New York, until Nov. 10 for completing the abandoned contract of the Andrews Building Company and the Southern Surety Company for providing all labor and materials necessary required for the excavation, masonry, carpentry, painting, electric, refrigerating and other work for the construction of a machine room, coal vault and storage room to the Harlem Hospital, 136th-137th Streets and Lenox Avenue. Blank forms and further information may be obtained at the office of the chief clerk and auditor, 400 East Twenty-ninth Street, New York, N. Y.

BUTLER, PA.—The power and electrical departments of the plant of the Standard Steel Company at Butler were destroyed by fire recently, causing a loss of about $500,000.

JOHNSTOWN, PA.—Plans are being considered for improvements to the system of the Dale Light, Heat & Power Company, which was recently purchased by C. G. Holmes of Cincinnati, Ohio, including the installation of a new engine and generator and extenson of service lines into the borough of Lorain and part of Johnstown. L. H. Mountney is vice-president and general manager.

MEDIA, PA.—The Borough Council has awarded a contract for addition to the municipal electric plant, to provide space for the installation of an additional electric generating unit.

PHILADELPHIA, PA.—The Fred Pearson Company, manufacturers of plushes, have awarded contract for construction of a new engine room and power station at its plant at Wilde and Mallory Streets, to A. L. Fretz & Son.

PHILADELPHIA, PA.—The Pennsylvania Equipment Company, Coleman Building, Philadelphia, would like to receive prices on a 400 to 500-kw. motor-generator set, consisting of a three-phase, 60-cycle, 2200-volt, alternating-current motor and a 250-volt, direct-current generator.

SCRANTON, PA.—The United Service Company of Scranton has recently placed an order for a 5000-kva. Curtis turbo-generator for the Ohio Service Company, a subsidiary company, which operates plants in New Philadelphia, Coshocton and a number of other cities in Ohio. Contract has also been placed by the United Service Company for a 2500-kva. Curtis turbo-generator for the Warren (Pa.) Light & Power Company. The company is in the market for the necessary boilers, stokers and other auxiliaries. L. H. Conklin of Scranton is general manager.

SHARON, PA.—The Mahoning & Shenango Railway & Light Company of Youngstown, Ohio, has secured a contract from the National Malleable Castings Company of Sharon to furnish electrical energy to the amount of 2300 hp. to operate the new electric steel furnaces of latter company.

YORK, PA.—Preparations are being made by the Edison Light & Power Company for the installation of a new street-lighting system in York. The 250-cp. lamps now in use will be replaced with 400-cp. nitrogen-filled lamps. Part of the equipment has been purchased.

JERSEY CITY, N. J.—The coal-conveying plant at the power station of the Public Service Company at the foot of Duffield Avenue was partially destroyed by fire, including motors, conveyor and other machinery. The plant will be rebuilt at once.

NEW BRUNSWICK, N. J.—The Board of Commissioners has authorized the Mayor to enter into a contract with the Public Service Electric Company and the Public Service Gas Company for lighting the city for a period of five years.

ST. MICHAELS, MD.—The installation of an electric-lighting system is under consideration. Energy may be secured from the Easton plant.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Nov. 6 for furnishing under proposal No. 885, 48,000 ft. aviator and flexible cable, 8000 ft. aviator wire, 800 lb. brass wire and 200 lb. copper wire. For further information address Charles S. Wallace, major, signal corps, U. S. A.

WASHINGTON, D. C.—Bids will be received at the office of the chief signal officer, War Department, Washington, D. C., until Nov. 9 for furnishing 16 zone signal bells, 8 controllers, 48 incandescent lamps, 448 incandescent lamps, 16 push switches, 4 gal. coloring fluid and 448 outer zone signals. For further information address Charles S. Wallace, major signal corps, U. S. A.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., for furnishing at the various navy yards and naval stations supplies as follows: F.o.b. works, Schedule 319—one fuel oil apparatus, four water tube boilers; Schedule 326—411,000 lb. brass voice tubing. Washington, D. C., Schedule 321—one drilling and milling boring machine. Brooklyn, N. Y., Schedule 330—5000 ft. armored, controller cable, 2900 ft. telephone cable, 20,000 ft. twin-lamp cord, 100 000 ft. telephone cord, 565,000 ft. double-conductor wire. Boston, Mass., Schedule 330—9000 ft. copper wire tubular connectors, 650,000 ft. silicon bronze antenna wire; Schedule 328—126 wedge point soldering coppers, 120 gage glass cutters; Schedule 326—27,300 ft. brass voice tubing. Brooklyn, N. Y., and Mare Island, Cal. Schedule 325—eight 5-hp. turning gear motors. Mare Island, Cal., Schedule 335—500 lb. bar brass, 800 lb. brass pipe; Schedule 333-335—miscellaneous composition and galvanized iron steam and water fittings. Charleston, S. C., Schedule 323-324—1900 lb. brass tube sheets. Norfolk, Va., Schedule 329—miscellaneous brass pipe, 34,750 lb. brass evaporator tubes. Boston, Mass., Norfolk, Va., Schedule 329—miscellaneous copper pipe. Applications for proposal blanks should designate the schedule desired by number.

North Central

GRAND RAPIDS, MICH.—The City Council has authorized a loan of $10.000 for the city lighting fund, to be used for the installation of 100 new arc lamps.

IRON MOUNTAIN, MICH.—The Peninsular Power Company, which has been awarded a contract to supply energy to the Indiana Mining Company, will soon begin work on the erection of a transmission line from Twin Falls to supply the service. The initial installation will supply the crusher and pumping plants. Next year an electric haulage system and a number of individual motors will be installed.

AKRON, OHIO.—An election will soon be called to submit to the voters the proposal to appropriate $19,000, or as much as is necessary to install a new street-lighting system, power system and water pumping station.

CINCINNATI, OHIO.—Plans are being considered by the Champion Tool Works for the construction of a plant on Spring Grove Avenue, to cost about $100,000. A large amount of electrical equipment will be required. Harvey W. Kreuberg is president.

COLUMBUS, OHIO.—The Ohio Utilities Company of Columbus has petitioned the State Utilities Commission for permission to issue $1,050,000 in stocks and bonds, to be used for the purchase and for improvements to the electric plants at Chillicothe, Circleville, Delaware and Gallipolis.

EAST PALESTINE, OHIO.—Bids, it is reported, are being received by the Board of Public Affairs of East Palestine for the construction of a power plant and pumping station. W. C. Owen & Company, Euclid Building, Cleveland, are engineers.

ANDERSON, IND.—The Board of Public Works is considering the installation of a new 5000-kw. turbo-generator in the municipal electric-light plant, to cost about $50,000.

ANGOLA, IND.—Arrangements have been made by the Indiana Utilities Company to extend its transmission line from Angola to Fremont to supply electrical service in that town. While the line will carry 13,200 volts, it is designed for 33,000 volts. E. J. Condon, Jr., is superintendent of construction.

LA PORTE, IND.—The County Commissioners have awarded the contract for the construction of a new lighting and heating plant to the Larson-Danielson Construction Company of La Porte at $16,200.

CHICAGO, ILL.—Bids will be received by the city of Chicago, 406 City Hall, until Nov. 10 for furnishing and erecting, complete, at the municipal power plant two 3000-kw. turbine-driven alternators, with condensors, circulating pumps, air pumps, condensate pumps, transformers and accessories. Plans and specifications are on file in the office of the Department of Public Works.

CHICAGO, ILL.—The general contract for construction of a building, 100 ft. by 159 ft., four stories high, to be used as a power house, laundry and morgue for Cook County has been awarded to the John Griffin & Son Company, 112 West Adams Street; contract for refrigerating apparatus to M. W. Powell, 140 South Dearborn Street. Herbert A. Durr, 104 South Michigan Avenue, is consulting and mechanical engineer, and H. Zender, 535 County Building, is superintendent of public service.

EAST, ST. LOUIS, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Dec. 22, for extension and remodeling, including mechanical equipment and approaches of the United States post office and court house at East St. Louis. Drawings and specifications may be obtained at the above office or from the custodian at East St. Louis after Nov. 10.

GIBSON, ILL.—Bonds to the amount of $29,000 have been authorized by the voters. Of the proceeds $27,000 will be used for the installation of a municipal electric lighting system, and the remainder for improvements to the water-works system.

TROY, ILL.—Bids will be received at the office of the city clerk, Troy, until Nov. 6 for the purchase of the municipal electric-light plant, together with equipment, distribution and street-lighting system.

MANITOWOC, WIS.—The City Council has submitted a proposal to the West Side Power & Light Company offering to purchase its plant. William Rahr is president of the company.

PESHTIGO, WIS.—Interests connected with the Peshtigo Lumber Company, it is reported, are interested in a project to organize a company to develop the water power of Caldron Falls and to enlarge the water power plant in Peshtigo.

BUHL, MINN.—The contract for extension to the municipal electric-light plant has been awarded to Michael Boylan of Virginia, at about $32,000. New boilers, stokers and other appurtenances will be installed.

ST. PAUL, MINN.—The St. Paul Gas Light Company is contemplating improvements to its plant, including the installation of turbines, boilers, pumps, switchboard apparatus and transformers. F. A. Otto is superintendent of the electric department.

MARSHALLTOWN, IOWA.—Bids will be received by the board of education until Nov. 13 for the construction of a grade and high school building. Separate bids to be submitted for electric wiring, heating and plumbing. Reimer & Herlin of Marshalltown are architects.

WHAT CHEER, IOWA.—The Burlington (Iowa) Railway & Light Company has been granted a 25-year franchise to supply electricity here. A street-lighting system, to cost about $5,000, will be installed.

PLEASANT HILL, MO.—L. K. Green & Sons, owners of the local electric plant, contemplate rebuilding their plant, including erection of power house, 80 ft. by 100 ft., and smokestack, 9 ft. by 150 ft. Turbines and boilers have been purchased.

ST. LOUIS, MO.—Considerable amount of freight-handling equipment and elevators will be included in the municipal dock contract to be awarded by the Board of Public Service.

ST. LOUIS, MO.—The Board of Aldermen has passed a bill authorizing the expenditure of $12,500 for a preliminary survey to determine the advisability of establishing a municipal electric-light plant. The bill provides that the survey is to be made by a special corps of engineers under the supervision of the Department of Public Utilities.

BRUCE, S. D.—A special election will soon be held to submit to the voters the proposal to issue $7,000 in bonds for the installation of an electric-lighting system.

STELLA, NEB.—The local electric-light plant has been purchased by the Continental Gas & Electric Corporation of Cleveland, Ohio. The company has agreed to have electric lamps installed in Stella within 40 days. The town has been without street lamps since the engine of the local plant was wrecked last March.

BUFFALO, KAN.—At an election held recently the proposal to issue $15,000 in bonds for the installation of an electric-light plant and $15,000 for improvements to water-works system was carried.

OLATHE, KAN.—The Olathe Electric Light & Power Company will install a 300-kva. generator, engine and boiler in the near future. S. M. Brockway is secretary and treasurer.

Southern States

BETHEL, N. C.—The City Council is considering rebuilding the electric-light plant, which, it is reported, was destroyed by fire.

SPRAY, N. C.—The Westinghouse Electrical & Manufacturing Company of Pittsburgh, Pa., has been awarded the contract for equipping the eleven mills of Marshall Field & Company at Spray, N. C., for electrical operation. The contract will involve about $78,000.

TITUSVILLE, FLA.—The property of the Titusville Electric Company has been purchased by the Southern Utilities Company of Jacksonville, which will install a new plant.

BEARDEN, TENN.—Steps have been taken by Dr. M. L. Lee, president, and L. O. Edmonson, secretary of the Bearden Welfare Association, to organize a movement to establish a hydroelectric power plant to supply electricity in the city and operate the pumping station. The cost is estimated at $5,000.

FLORENCE, ALA.—Bids will be received at the office of the city clerk, Florence, until Nov. 13 for heating, lighting and plumbing equipment for the new High School Building. Plans and specifications may be obtained at the office of Knight & Quayle, engineers, Times Building, Chattanooga, Tenn., upon deposit of $5. M. M. Striplin is chairman of board.

YAZOO, MISS.—The Public Service Commission is considering the installation of a larger generator at the electric-light and water plant.

DUMAS, ARK.—Bids will be received by the Board of Improvement, District No. 2, of the town of Dumas, Ark., until Nov. 28, for the purchase of $15,000 in bonds for the construction of an electric-light plant. B. C. Bowles is secretary.

DUMAS, ARK.—Bids will be received by the Board of Commissioners of Electric Light Improvement District No. 2 of Dumas, until Nov. 28, for furnishing all material and labor for the installation of an electric-light plant in accordance with plans and specifications on file at the office of B. C. Bowles, secretary of board. Copies of specifications may be obtained on application to H. W. Wright, engineer, McGehee, Ark., upon payment of $2.50 to cover cost of same.

WALDRON, ARK.—The Waldron Power & Ice Company, recently organized with a capital stock of $10,000, is planning to construct an electric-light plant and ice factory. J. S. Hill and others are interested.

WELSH, LA.—Bonds to the amount of $15,000 have been voted for the purchase of an additional engine for the municipal electris plant and extension to electric-lighting system.

AFTON, OKLA.—R. E. Overton of Vinita, representing the Public Service Corporation of Oklahoma is negotiating with the Board of Trustees for the purchase of the municipal electric-light plant. If the plant is not taken over by the company a bond issue will probably be voted to provide funds for improvements to the plant.

BUFFALO, OKLA.—Bonds to the amount of $15,000 have been voted for the installation of an electric-light plant.

HOUSTON, TEX.—The new municipal warehouse, which is to be erected in Houston at a cost of about $350,000, will be equipped with an electrically operated conveyor system and a 20-ton electrically-operated crane

SAN ANGELO, TEX.—The Interstate Electric Corporation of New York, N. Y., has accepted the franchise for operating a street car line here, subject to the approval of the voters. If accepted the company will expend about $125,000 for improvements to the system.

Pacific States

CAMAS, WASH.—Initial steps have been taken by the residents of the Oak Park District toward securing an adequate street-lighting system.

PORT ANGELES, WASH.—Bonds to the amount of $25,000 have been sold, the proceeds to be used to retire outstanding warrants for improvements and extensions to the municipal electric-light plant. Bids have been received for equipment, etc., for the new street-lighting system.

CHULA VISTA, CAL.—The San Diego Electric Railway Company is contemplating the construction of a substation in Chula Vista.

EMERYVILLE, CAL.—Ground has been broken for the construction of the open-hearth steel furnace for the Judson Iron Works, to cost about $100,000. Among the improvements contemplated by the company in the general reconstruction of the plant is the complete equipment of the mills for electrical operation, supplanting steam power now in use.

FRESNO, CAL.—The City Trustees have authorized bids advertised for the erection of ornamental lamps on I Street, between Inyo and San Diego Streets. A resolution has been adopted of intention to install ornamental lamps on J Street, between Inyo and Los Angeles Streets.

FRESNO, CAL.—The Board of Supervisors has voted to install an ornamental lighting system in Court House Park under the supervision of Scott McKay county surveyor. The plans provide for the erection of 94 cast iron standards, conduits, etc., to cost about $9,800. The lowest bid submitted some time ago was $13,987.

LOS ANGELES, CAL.—Bids will be received by the Board of Public Works in about 30 days for installation and furnishing energy for the lighting of Sixth Street, between Palos Verdes Street and Pacific Avenue.

SOUTH PASADENA, CAL.—Bids will be received by B. V. Garwood, city clerk of South Pasadena until Nov. 13 for erecting 28 one-lamp Marbelite posts on Mission Street, between Fair Oaks Avenue and Prospect Avenue. Plans and specifications are on file in the office of the city engineer.

WALLACE, IDAHO.—The Roberts-Inskip Plumbing & Heating Company of Wallace has applied for a franchise to supply heat and light here. H. H. Hutton of Spokane, Wash., is interested in the company.

DUNCAN, ARIZ.—J. P. Oberholser and C. E. Adams, owners of the local electric-light plant, contemplate improvements to the system.

FROID, MONT.—Improvements are contemplated by the Froid Electric Light & Power Company, including the installation of a 20-hp. engine.

GLASGOW, MONT.—A new electrically-driven pump, with a capacity of from 300 to 700 gal. per minute, is being installed in the municipal electric-light plant. Charles H. Blitman is city engineer and manager.

ROUNDUP, MONT.—The contract for the installation of street lamps in special lighting district No. 15, calling for 2120 lamps. 27,500 ft. of simplex park and suburban cable, has been awarded to the Olgo Hardware Company of Roundup, at $19,202.

Canada

WINNIPEG, MAN.—Preliminary surveys are being made by the Manitoba Pulp & Paper Company for a power development at Grand Rapids, which will include a dam and power plant. D. B. McDonald is manager.

BRIDGEBURG, ONT.—Plans have been completed for the proposed electric railway to be built by the Ontario Hydro-Electric Power Commission from Welland to Port Colborne, via Fort Erie to Bridgeburg. The cost of the railway is estimated at $2,000,000.

CALABOGIE, ONT.—Work has started on the development of site and construction of power plant at Calabogie. The cost of the project is estimated at $150,000, and includes power house, concrete dam, water wheels, generators, etc., and the erection of about 60 miles of transmission lines. M. J. O'Brien of Renfrew is interested.

WAHNAPITAE, ONT.—Work has been started on the construction of a concrete dam in connection with a power development at Wahnapitae for the British Nickel Corporation, Excelsior Life Building, Toronto. The cost of the work is estimated at $1,250,000. A. J. Fello is in charge.

Directory of Electrical Associations

Printed in the First Issue of Each Month

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NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, George H. Duffield, 41 Martin Building, Utica, N. Y. Next meeting, New Orleans, October, 1917.

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WESTERN ASSOCIATION OF ELECTRICAL INSPECTORS, Secretary, W. S. Boyd, 175 Jackson Bldg., Chicago, Ill.

WESTERN SOCIETY OF ENGINEERS, ELECTRICAL SECTION. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago.

WISCONSIN ELECTRICAL ASSOCIATION. Secretary, George Allison, 1410 First National Bank Building, Milwaukee, Wis.

1,202,020. Battery Connector; C. E. Berkley, Cleveland, Ohio. App. filed Aug. 11, 1914. Metal cap for attaching to dry cell electrodes.

1,202,202. Visible Alarm for Automobiles; J. H. Millsaps, Washington, D. C. App. filed June 14, 1915. Operated if started by person without authority.

1,202,037. Combination Switch; A. J. Donnellon, Cincinnati, Ohio. App. filed Aug. 17, 1915. For ignition devices to control application of electric current.

1,202,071. Lock for Electric Switches; F. H. Keith, Joliet, Ill. App. filed Aug. 12, 1915. Quickly attached to front of coil box.

1,202,078. Cell Tester; J. O. Luthy, San Antonio, Tex. App. filed Feb. 26, 1913. Indicates voltage of battery.

1,202,091. Panelboard; R. H. Olley, Syracuse, N. Y. App. filed Oct. 6, 1910. Simple and efficient arrangement of conducting bars.

1,202,092. Panelboard; E. A. Olley, Syracuse, N. Y. App. filed May 6, 1912. Compact arrangement and novel structural features.

1,202,097. Device for Testing Rail-Bonds; E. L. Pollard, Dobbs Ferry, N. Y. App. filed July 2, 1912. Means for transporting and supporting recording and indicating device.

1,202,127. Ignition System; C. Upton, Baltimore, Md. App. filed May 14, 1912. Improved means for producing spark to start engine.

1,202,128. Ignition Device; H. R. Van Deventer, Sumter, S. C. App. filed Feb. 21, 1916. Adjacent cylinder operated from push rod actuated by engine piston.

1,202,136. Process of Renewing Filaments in Lamps; A. A. Wilkins, Middletown, Mass. App. filed April 2, 1914. Suitable for use in tungsten lamps.

1,202,149. Electrolysis of Tin and Its Salts; A. E. Battle, Aldgate, England. App. filed May 24, 1915. Electrolyte enabling metal to be obtained from its ores or from surfaces of other metals, as from tinned plate.

1,202,161. Compression-Rheostat; E. L. Clark, Lakewood, Ohio. App. filed Nov. 15, 1915. Securing rapid and efficient radiation of heat generated.

1,202,168. Electromagnetic Wave-Receiving System; E. B. Dallin, Arlington, Mass. App. filed Aug. 14, 1915. Of simplified construction and improved efficiency.

1,202,179. Morse Transmitting-Key; J. C. Ghegan, East Orange, N. J. App. filed Dec. 15, 1915. Adjustable removable contacts so that full contact surface can be maintained irrespective of wear.

1,202,186. Signal; C. O. Harrington, Edgewood, Pa. App. filed July 12, 1913. Railway signals in which lamps are employed for signaling day and night.

1,202,210. Gas-Engine Governor; P. Okey, Columbus, Ohio. App. filed Dec. 9, 1910. For engine used in connection with electric generators.

1,202,275. Register-Controller; A. H. Dyson, Montclair, N. J. App. filed June 29, 1915. For semi-automatic telephone exchange system.

1,202,281. Machine Switching Telephone Exchange System; C. L. Goodrum, New York, N. Y. App. filed June 28, 1915. Step by step type wherein trunks lead from connectors to private branch exchange switchboards.

1,202,291. Direction Indicator for Automobiles; J. Ingells, Muskegon, Mich. App. filed July 6, 1915. Designates direction automobile is to take.

1,202,306. Station Indicator; J. E. Olis, Philadelphia, Pa. App. filed Aug. 20, 1915. For use on street cars moved electrically to indicate street along route.

1,202,362. Thermo Electric Relay; T. E. Clark, Detroit, Mich. App. filed March 1, 1912. Responsive to flow of current in receiving circuit from high frequency and high potential current.

1,202,367. Reverting Busy Test for Telephone Systems; H. D. Currier, Chicago, Ill. App. filed Nov. 19, 1914. Having common test relay adopted for connecting reverted test tone to cord circuit being used, such test tone being disconnected by relay.

1,202,381. Socket Switch for Electric Lamps; C. J. Gustafson, Springfield, Mass. App. filed Dec. 13, 1913. For use with electric head and tail lights for motorcycle.

1,202,388. Toy or Working Model; F. Hornby, Liverpool, England. App. filed April 12, 1915. Engineering models made from separate parts capable of being taken apart and remade.

Record of Electrical Patents

Notes on United States Patents issued Oct. 24, 1916, prepared by Mitchell & Allyn, 41 Park Row, New York.

1,202,392. Electromagnet; J. W. Jepson, Depew, N. Y. App. filed Feb. 20, 1915. Means for compensating for effect of temperature changes upon attractive force.

1,202,418. Insulator Support; C. L. Peirce, Jr., Pittsburgh, Pa. App. filed May 4, 1914. Pin bent from metal, so strength at any section is proportionate to strain.

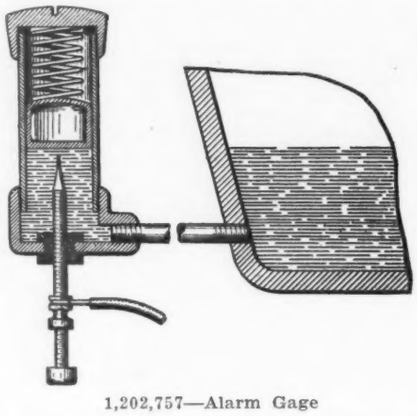
1,202,419. Insulator Supporting Pin; C. L. Peirce, Jr., Pittsburgh, Pa. App. filed May 17, 1916. For metal pins adapted to be secured against sides of wooden crossarms.

1,202,446. Electromagnetic Device; J. B. Speed, West New Brighton, New York, N. Y. App. filed Feb. 12, 1915. For translating alternating current into a form of energy capable of actuating a mechanically operated device.

1,202,478. Service Switch and Wiring for Electric Meters; A. W. Bull, Baltimore, Md. App. filed June 14, 1915. Means for connecting potential coil of meters to line whereby current will always flow in such coil when any current passes in load wires.

1,202,498. Illuminated Blank Book; W. F. X. Findley, Chicago, Ill. App. filed Feb. 19, 1916. Improved adaptation of means for illuminating book.

1,202,527. Motor for Steam Radiator Valves; L. P. Hynes, Chicago, Ill. App. filed May 19, 1913. Magnetically operated valve.



1,202,757—Alarm Gage

1,202,532. Tester for Spark Plugs and Ignition Apparatus; J. M. Keller, Nappanee, Ind. App. filed March 31, 1915. Novel means for determining condition of spark-producing coils and spark plugs.

1,202,534. Production of Metallic Tungsten; F. G. Keyes & R. B. Brownlee, E. Orange, N. J. App. filed July 6, 1914. Rotating cathode of tungsten and anode in the form if sintered rod of tungsten through which and the oxid bath electric current is passed.

1,202,535. Production of Metallic Tungsten; F. G. Keyes & R. B. Brownlee, E. Orange, N. J. App. filed June 6, 1914. Electrolyzing both a suitable cathode and anode consisting of sintered tungsten powder and low tungsten oxids cast in form of an anode bar.

1,202,555. Code Ringing Telephone System; T. G. Martin, Chicago, Ill. App. filed Oct. 4, 1916. Means whereby code ringing may be done automatically.

1,202,577. Circuit Closing Valve for Internal Combustion Engines; R. J. Peschman, Ft. Sheridan, Ill. App. filed Aug. 6, 1915. Indicating failure of any particular cylinder.

1,202,622. Automatic Electric Generating System; A. R. Van Horn, Philadelphia, Pa. App. filed Dec. 27, 1912. Automatic in operation during normal conditions but sounding alarms under abnormal conditions until such are remedied.

1,202,632. Electric Current Generating Plant; E. R. Witzel, Des Moines, Iowa. App. filed June 6, 1914. Wherein the battery is automatically cut out of load circuit and disconnected from generator as speed of latter increases.

1,202,672. Generator for Static Electricity; W. H. Chapman, Portland, Me. App. filed Dec. 4, 1914. New means of developing charge on plate by which power frictional losses are reduced.

1,202,714. Lightning Arrester; D. J. Hendren, Burnside, La. App. filed March 25, 1916. Novel structural features rendering it efficient and inexpensive to manufacture.

1,202,745. Adjustable Lamp Support; J. W. Lindner, Post Falls, Idaho. App. filed June 7, 1915. Provision of support wherein lamp is adjustably held with relation to its attaching portion.

1,202,752. Electric Generator; F. Newton, Luton, England. App. filed June 17, 1911. To regulate to yield constant voltage on current as required in spite of variation of drive speed.

1,202,756. Telephone; F. Troisi, Pittsburgh, Pa. App. filed March 27, 1916. Means whereby bell may be arranged in base of pedestal of telephone.

1,202,757. Alarm Gage; E. M. Barnes, Hastings, Mich. App. filed June 24,.1915. For use as oil gage for crank cases of internal combustion engine.

Record of Electrical Patents Issued Oct. 17, 1916

(*Continued from Issue of Oct. 28.*)

1,201,809. Printing Telegraph Receiver; A. F. Dixon, Newark, N. J. App. filed Oct. 14, 1913. Improved means for receiving prolonged line impulse to insure positive operation; apparatus remains inactive unless combination of impulse contains at least one selecting impulse.

1,201,830. Electric Socket; G. C. Knauff, Chicago, Ill. App. filed Sept. 9, 1915. Construction in which body member may be removed to permit speedy substitution of single-pole for double-pole mechanism.

1,201,837. Portable Means for Securing the Reverse Flow of Electric Currents; J. C. Lincoln, Cleveland, Ohio. App. filed Feb. 6, 1914. Comprises apparatus in connection with trolley circuit for reversing current to effect electric welding of bonds and rails.

1,201,841. Display Apparatus; H. Mahieu, Jamaica, N. Y. App. filed Aug. 26, 1914. Plurality of trade names exposed to view at different places and times.

1,201,858. Station Indicator; W. Z. Musgrave, Chicago, Ill. App. filed May 24, 1915. Of few parts and positive in operation circuit closing mechanism so arranged to be operative in either direction of travel.

1,201,869. Circuit Controller; W. C. Reed, Dalton, Mass. App. filed Sept. 11, 1914. Means by which a large number of electric circuits may be opened or closed by means of single movement of controller.

1,201,909. Wire Splice and Lead Line Connector; H. D. Zinn, E. R. Danser and L. D. Vaugn, Tunnelton and Grafton, W. Va. App. filed Jan. 19, 1915. Device adapted for use in mines for connecting and supporting ends of trolley wires.

1,201,918. Refillable Fuse Cartridge; I. E. Barricklow, San Francisco, Cal. App. filed Oct. 10, 1914. Fuse element may be replaced when same has blown out; fuse condition indicated upon cartridge.

1,201,921. Rheostat; C. H. Beach, Racine, Wis. App. filed Oct. 25, 1915. To control small motor such as used for sewing machine.

1,201,929. Method and Apparatus for Inductively Generating Heat in Applying Rail Bonds and the Like; G. H. Bolus, Mansfield, Ohio. App. filed July 31, 1916. Produces localized heat for purposes such as welding, soldering, etc., by induction.

1,201,637. Electric Time System; H. R. Sargent, Schenectady, N. Y. App. filed July 27, 1915. Time indicating devices adapted to be controlled by master clock.

1,201,939. Battery Box; A. B. Cole, Caldwell, N. J. App. filed Oct. 3, 1914. Necessary connections made when box cover is closed.

1,201,996. Electrical Measuring Instrument; G. Campos, Milan, Italy. App. filed Oct. 10, 1913. Indicates electrical power at a different point in circuit from that at which it is introduced.